

**REGISTERED NURSES PERCEPTIONS OF MEDICATION  
ADMINISTRATION ERRORS AND THEIR MANAGEMENT IN  
SAUDI ARABIAN HOSPITALS**

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## List of abbreviations

<b>MAEs</b>	Medication administration errors
<b>IAEA</b>	International Atomic Energy Authority
<b>HSC</b>	UK Health and Safety Commission
<b>ICAO</b>	The International Civil Aviation Organization
<b>IOM</b>	Institute of Medicine
<b>WHO</b>	World Health Organization
<b>NCCMER</b>	The National Coordinating Council for Medication Errors Reporting and Prevention
<b>KSA</b>	Kingdom of Saudi Arabia
<b>BSN</b>	Bachelor of Science in Nursing
<b>MOH</b>	Ministry of Health
<b>OVR</b>	Occurrence Variance Reports
<b>POE</b>	Physician Order Entry
<b>BCMA</b>	Barcode of Medication Administration
<b>CSMC</b>	Complex Systems Modeling Group
<b>IM</b>	Intramuscular
<b>IV</b>	Intravenous
<b>SC</b>	Subcutaneous

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## **ABSTRACT**

### **Background**

Medication error is a global issue that can cause serious harm and even death. Nurses who are responsible for administering medication at the patient interface have the potential to contribute to the problem by making medication administration errors or preventing errors before medication is given. There are multiple contributory factors to the occurrence of error; active failures, local conditions and latent conditions but in order to build a safe culture for patients, it has been recommended that as well as having systems and procedures in place to prevent error, it is important to know the values and beliefs of the staff involved to ensure that they play their part in communicating and preventing errors. In a multi-cultural nursing context such as that in Saudi Arabia the values and beliefs of nursing staff may be different to those in other parts of the world.

### **Aims**

The study was designed to explore nurses' perceptions of medication administration errors in Saudi Arabia. It sought to collect nurses' views about the factors that may influence medication administration errors, barriers to error reporting and strategies to promote safe medication administration.

### **Methods**

A systematic review was undertaken to contextualise the study and identify a gap in the literature. The methodological design adopted for this study is non-experimental, descriptive mixed methods. Quantitative and qualitative components were applied sequentially in two phases. Questionnaires (N=236), and semi structured interviews (N=19) were used to further explain nurses' perceptions and views on managing medication errors in Saudi Arabia.

### **Results**

The systematic review highlighted a lack of in-depth and comprehensive studies of nurses' perceptions of medication administration errors. This study found that in line with the international literature there are a range of factors that contribute to errors, however, in Saudi Arabia the highest perceived factors were high workload and poor handwriting. There is an

underreporting of errors and the fear of the consequences remains the most significant barrier against reporting medication errors. Nurses appear to weigh up the risk to patients before deciding whether to report errors or not. Solutions for minimising errors can be found in a number of strategies at different levels of the organisation; these include staff training and technology solutions such as computer physician order entry (CPOE) or barcode technology.

## **Conclusion**

The findings in the current study offer a comprehensive understanding of the views and perceptions of nurses regarding medication errors within the Saudi context. This provides valuable local evidence that can be built into appropriate professional education and procedures for managing medication administration errors for both Saudi and international nurses employed in Saudi Arabian hospitals and thus improve patient safety.

# **Chapter 1: Introduction**

## **Introduction**

This thesis describes an original study regarding nurses' perceptions of the causes of medication administration errors in hospitals in the Ha'il region of Saudi Arabia. It examines the nurses' experience of medication administration errors, their views of the causes of errors, their professional role and responsibility to report and manage medication errors, factors that may influence medication administration and errors in health care settings, and their perceptions of any possible strategies taken by their institutions to manage and minimise medication errors in these institutions. This study has been conducted at a time when there is scarce evidence on the topic and little open debate about safety in healthcare, particularly in Saudi Arabia. The idea of the study was built and developed from the researcher's experience whilst working in a variety of nursing specialties in Saudi Arabia and dealing with issues related to medication administration errors, reporting errors, and observing nurses' and managers' behavioural reactions when errors occurred.

The aim of the study is to investigate nurses' perceptions of medication administration errors in hospitals in the Ha'il region of Saudi Arabia. Four main objectives were considered to achieve the aim of this study:

1. To explore nurses' experience of medication administration errors in Saudi Arabia
2. To explore nurses' perceptions on their professional role and responsibility to report and manage medication administration errors.
3. To explore nurses' views about the factors that may influence medication administration errors in hospitals.
4. To examine nurses' perceptions on strategies to promote safe medication administration



## **Overview of the thesis**

This thesis is reported in seven chapters (Introduction, literature review, methodology, and findings from quantitative study, findings from qualitative study, discussion, conclusions and recommendations).

This chapter provides an overview and context for the study. It places the safety of medication administration within the wider safety culture. This chapter also describes medication errors in the global context and in Saudi Arabia where this current study is based. It was also crucial to put this study within a context through providing an overview of the health care delivery system and professional and regulatory bodies in Saudi Arabia.

Chapter two presents the results of an initial scoping review, which was used to justify the need for the study and develop the questionnaire that was used for the quantitative part of the study. This was followed by a systematic review on the evidence of nurses' perceptions on medication administration errors.

Chapter three outlines the theoretical framework that underpins the study and then describes the methodological choices made in planning this research with their justification. A mixed method design has been selected. The study's research methods, including a detailed presentation of related issues such as sampling, recruitment of participants, data collection, ethical considerations, and data analysis plan are presented.

In chapter four, data from the quantitative part of the study is presented, describing results and analysis of the questionnaire which provides evidence on nurses' perceptions of the multiple factors that contribute to medication administration errors in health care settings.

In chapter five, data from the qualitative part of the study is presented. The data was obtained from semi structured interviews which used scenarios to provide a more in depth understanding of how nurses recognise, report and manage medication administration errors in their practice.

The discussion in chapter six presents a comparison and triangulation of these two sets of data to draw together the evidence and provide a more in-depth analysis of nurses' perceptions regarding medication administration errors in Saudi Arabia. This evidence is compared and contrasted with the evidence from the literature in chapter two.

Chapter seven provides an overall summary of the thesis and presents conclusions and recommendations for future research and practice whilst highlighting the original contribution to knowledge made by this thesis.

## **Safety culture**

The problem of medication administration errors within healthcare is part of a wider issue regarding patient safety. Healthcare is not alone in considering the issue of safety, many industries world-wide are showing an increasing interest in the concept of a “safety culture” as a means of minimising the potential for accidents associated with routine tasks. Aviation and other safety relevant industries have been frequently held up as examples for healthcare to emulate because of their ability to achieve safety in the face of high risk and potentially catastrophic loss of life. The parallels between healthcare and other industries can be overstated. However, the measurement and monitoring of safety in both high risk (construction, oil, nuclear and aviation) and industrial (food, manufacturing) settings is potentially extremely informative for healthcare, both in terms of the measures used and the regulatory context in which they operate (Vincent, 2013).

There are a number of different viewpoints regarding the concept of a safety culture. Cooper (2000) provides an overview and number of definitions. One of these is that safety culture includes “the set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimising the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious” (Turner, 1989). Safety is always only one consideration within broader endeavours, whether in healthcare or in any other field. As an oil executive expressed, “*Safety is not our top priority. Getting oil out of the ground is our priority. However, when safety and productivity conflict, then safety takes precedence*” (Vincent, 2010). Similarly, in healthcare, the main objective is providing healthcare to large numbers of people at a reasonable cost, but this needs to be done safely. Nursing, as an independent profession with its own regulations, may use other industries’ and disciplines’ experiences to improve nurses’ practice, for example in managing errors and safety; this can be described as organisational learning (Vincent, 2013). One of these experiences relates to proactive and reactive measures, that nurses may take to prevent or manage medication errors. However, the specific tools, techniques and methods of other industries may not always transfer easily to

healthcare (Vincent, 2013). Lawton (2002) suggests that an alternative means of implementing organisational learning is to identify system (latent) failures before, rather than after an adverse event. For example, the decision at a senior level not to replace a faulty piece of equipment in the ICU might lead to the misreading of a dial which could cause a wrong dose (medication error) or the switching off of an alarm (violation). One of the benefits of measuring safety culture is that it provides a tangible indicator of the current status and progress over time of how organisations and teams implement improvements (Vincent, 2013), that is, how the organisation or team carries out organisational learning in this area.

In recent years there has been an increasing focus in the United Kingdom and worldwide on approaches to improve safety and this has led to greater recognition of the importance of the culture of organizations and teams in the improvement process (The Health Foundation, 2011). According to the Health Foundation, safety culture is considered as part of the overall culture of an organisation in different disciplines including health care (The Health Foundation, 2011). In health care, the latter reported that safety culture was addressed in policies, guidelines and national priorities in the UK and worldwide. A safety culture can be assessed through quantitative survey measures which explore team communication and shared perceptions of the importance of safety. Considering all these aspects, safety culture is broadly defined as, *“A global phenomenon that encompasses the norms, values, and basic assumptions of an entire organisation.”*

Leonard and Frankel (2012) believe that a robust safety culture is the combination of attitudes and behaviours that best manage the inevitable dangers created when humans, who are inherently fallible, work in extraordinarily complex environments. In their well thought out paper they also suggest that minimising risks and errors is associated with the extent to which leaders are aware of managing attitudinal and behavioural norms. Thus, knowing the values, beliefs, rituals, symbols, behaviours and perceptions that nurses hold about safety in their workplaces should help management evaluate their safety culture programs, and predict the extent to which staff will participate in improving patient safety and quality of care through communicating errors (Cooper, 2000; IOM, 2000).

Leonard and Frankel (2012) describe “norms” which need to be in place to ensure effective leadership regarding safety. These include *psychological safety* in which leaders create an environment to encourage speaking out and report medication errors and ensure that errors are dealt with positively and respectfully. *Organisational fairness* is also important, this is where caregivers know that they are not accountable for system failures, and rather they are accountable for being capable, conscientious and not engaging in unsafe behaviour. Finally, *learning systems* where leaders are keen to hear patients’ and nurses’ concerns regarding any defects that interfere with providing safe care and increasing safety. Moreover, the provision of safe and reliable care requires a safety culture, continuous learning, and improvement. The role of effective leaders is to support this work by defining the goals and values of their organisation. Effective leaders must also address the behaviours that create unacceptable risk, such as disruptive or disrespectful behaviour, and send a very clear message that these behaviours will not be tolerated. According to Leonard and Frankel (2012), the real test of leadership and organisational culture comes when someone does act in this way. Leaders should be consistent in holding people accountable for unacceptable behaviours that create risk in order to provide a strong safety culture (Leonard & Frankel, 2012).

Taking both human and organisational factors into account, Leonard and Frankel (2012) suggest that when there has been an adverse event or near miss, it is important to have a simple procedure that allows the organisation to determine between unsafe individuals and skilled individuals set up to fail by an unsafe system.

### **The importance of patient safety and medication safety**

Patient safety can be defined as ‘the avoidance, prevention and amelioration of adverse outcomes or injuries stemming from the process of health care’ (Vincent, 2010). Ensuring a patient’s safety is a major concern in today’s health care system and the first on the list of health policy agenda in many countries (WHO, 2002). It has become clear that patient safety is one of the cornerstones of high quality care. Additionally, improving patient safety is an ethical responsibility for health care services. Error prevention and safety promotion are the responsibility of health care providers within the health care delivery system (WHO, 2002).

Patient safety, particularly safe medication administration and preventing medication administration errors is the focus of this thesis. This is applicable to nurses in all stages; training, practicing, and continuing education. Nurses are the first line of defence for patients and as they have a role in administering medication, they have an important role in preventing and managing errors at the patient care interface, in comparison to the doctors who prescribe the medicine or the pharmacists who dispense the medicines (Kohn et al., 2000; Dowdell, 2004).

Advances in knowledge and technology have made patient safety more likely but they have also created a more complicated system of healthcare. As with any system, health care complexity carries its own risks and things to go wrong, no matter how devoted and professional the health care staff. These incidents, particularly medication errors are widespread and can reappear with physical and emotional consequences not only for patients and their families, but also for staff. Notably, there are also unavoidable events that may lead to more complicated consequences and even possible fatalities. More widely, these incidents and events can also increase the cost of treatment through litigation and extra treatment (National Patient Safety Agency May, 2006).

The Harvard Medical Practice Study (HMPS), conducted by Brennan and Leape, was published in two consecutive landmark papers (Brennan et al., 1991, Leape et al., 1991); when several countries reported shocking numbers of patients harmed or even killed by medical errors, that the frequency and magnitude of avoidable adverse patient events became known. This was the impetus for the publication of a report, ten years later, by the Institute of Medicine (IOM) of the National Academy of Sciences, *To Err is Human: Building a Safer Health System* (Kohn et al., 2000) which brought health professionals' attention towards the problem. The report showed that health care errors affect almost 1 in every 10 patients around the world and the World Health Organisation in 2002 called patient safety an endemic concern (World Health Organisation (WHO), 2002). However, the report focused on an external environment, policy and market strategy that can be employed to encourage actions by health professionals and health care organisations. However, this report neglected the values and beliefs of health professionals that were described as the major forces for improving patients' safety. As different organisations have different cultural values and beliefs, the figures in the report may not be applicable across all institutions. This is a particular issue for Saudi Arabian healthcare organisations which are highly multicultural with a wide range of different values and beliefs.

Figures from the Institute of Medicine (IOM) show that medication errors injure at least 1.5 million people annually. The medical costs of treating medication errors related injuries occurring in hospitals are roughly 3.5 billion dollars per year in the United States of America (IOM, 2006). The variation of medication errors rate ranges from 2 to 14% of hospitalised patients. Medication errors have been estimated to kill 7000 patients annually and account for nearly one in 20 hospital admissions in the USA and the UK (Williams, 2007). Failure to ensure the integrity of the medication administration process compromises patient safety which has become a major concern for healthcare professionals. Among patient safety issues, are for example, patient identification, transfusion error, prevention of falls and suicide, however, medication safety has also been regarded as a most important indicator of health-care quality (Benjamin, 2003; Joint Commission on Accreditation of Healthcare Organizations, 2006). Furthermore, it has been shown that among all medication errors in chemotherapy and paediatric inpatients, administration errors were the most common errors followed by prescribing errors (Ghaleb et al., 2010). ADE is more clinically significant than the ADR for example: over-sedation and aspiration pneumonia resulting from a 10 fold overdose of drug would not be considered an ADR according to the WHO definition, but would be considered an ADE (Bates, 1995). Injuries due to drugs were the most frequent cause of malpractice claims. Reviewers considered ADEs as preventable if they were due to an error (Bates, 1995).

Most drug errors do not cause injury, for example missing a single dose. To decrease injury it is clear that efforts must be directed to reducing errors (Leape et al., 1995). A single proximal cause can result in a variety of errors: for example, a lack of knowledge resulting in improper dose or wrong technique. Furthermore, one type of error can result from several different proximal causes: for example, if a patient receives the wrong dose because the physician lacks knowledge or due to a rule violation (Leape et al., 1995).

The National Coordinating Council for Medication Errors Reporting and Prevention (NCCMERP) in the United States of America (USA) takes the stance that there is no acceptable incidence rate for medication errors, and that the goal should be to continually improve health care systems so that medication errors are prevented (NCCMERP, 2002). Thus, interventions are

needed to decrease defined medication errors and improve patient safety through all stages of medicine management, including safe medication administration.

### **Definitions relating to error**

As can be seen from the section above, different terminology is used when describing errors and rates of error across the world. Thus, when studying medication administration errors by nurses, it is important to consider definitions of error, what these mean and their potential impact on the study. There is no generally accepted definition in the literature about what constitutes an error (Lisby et al., 2005). This makes it difficult to compare studies. According to Armitage (2009), the concept of error has long been associated negatively with individuals, for example, seeing the error of a person's behaviour, implies that the person has engaged in some wrongdoing (Armitage, 2009). More recently, the concept of error has been associated with computers and systems. Error should be seen as being inevitable, and although its causation has been linked to individuals, errors in organisations can have multiple causes (Armitage, 2009). One of the most pragmatic definitions of error is that of Reason (1990, P. 9) who proposed that an error is *“the failure of a planned action to be completed as intended without the intervention of some unforeseeable event; or the use of a wrong plan to achieve an aim”*. It is worth noting that Reason's definition uses the terms “intervention” and “unforeseen events” suggesting accidental and multifactorial causes, rather than linking an error to a wrongdoing by a particular individual.

There are several definitions for the term ‘medication error’. For example, ‘medication error’ is defined as *“any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer”* (NCCMERP, 1995). Another definition for medication error to overcome the previous definition's limitation and to enhance clarity of definition by Aronson (2009) is, *“a failure in the treatment process that leads to, or has the potential to lead to, harm to the patient.”* The Veteran Affairs (VA) Centre for Medication Safety in 2006 reported that medication errors may occur during prescribing, transcribing, dispensing, administering, adherence, or monitoring a drug.

The term ‘medication administration’, is generally used in the literature to describe the process which a nurse undertakes when preparing and giving medication to a patient. This separates the

activity from the prescribing of medications by doctors and dispensing of medications by pharmacists. Therefore, nurses may make errors during medication administration which are called ‘medication administration errors’ and these errors may occur in different stages of administering medications. As this is the process which are of interest for this study, the term ‘medication administration errors’ was selected in light of the aims and objectives.

An adverse drug event (ADE) is defined as an injury resulting from medical intervention related to a drug, and can include either a medication error or an adverse drug reaction (ADR). ADR is defined as “*A response to a drug which is noxious and unintended, and which occurs at doses normally used in man for the prophylaxis, diagnosis, or therapy of disease, or for the modifications of physiological function*” (WHO, 1972), and which occurs due to factors related to the patient such as sensitivity to the drug when doses are normally used in the right way.

The figure below shows how medication errors are common in adverse events and reactions.

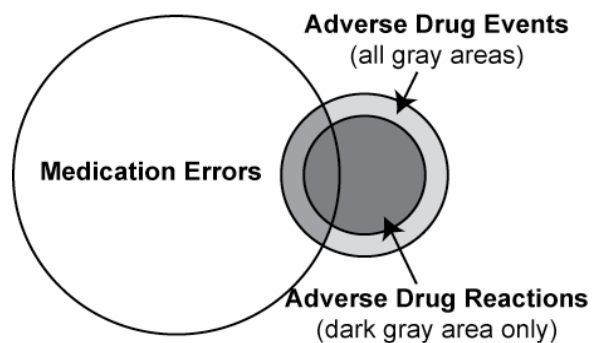


Figure (1.1): Medication errors to adverse drug events and reactions (Nebecker et al., 2004)

To further clarify, an ADR has been defined as harm that results from a medication dose that is “normally used in man.” An ADE has been defined as harm associated with any dose of a drug, whether the dose is “normally used in man” or not. An ADR, therefore, is a subtype of an ADE (i.e., all ADRs are ADEs, but not vice versa). By definition, all ADEs are associated with patient harm, but not all ADEs are caused by an error (NCCMERP, 1995).



“Preventable ADE” is harm caused by the use of a drug as a result of an error (e.g., a patient given a normal dose of drug but the drug was contraindicated in this patient). These events warrant examination by the provider to determine why it happened.

“Non-Preventable ADE” is drug-induced harm occurring with appropriate use of medication (e.g., anaphylaxis from penicillin in a patient and the patient had no previous history of an allergic reaction). While these are currently non-preventable, future studies may reveal ways in which they can be prevented. Organisations should look for preventable ADEs and not just ADRs because the preventable ADEs are more likely to cause serious injuries and represent the area in which improvement is possible.

Other types of medication error such as errors in prescribing medications are also common; these might be doctors or nurses’ errors. Prescribing is the process whereby a doctor, nurse or other registered professional authorises use of medications or treatments for a patient and provide instructions about how and when those treatments should be used (Haas et al., 2012). Prescribing errors can take many forms, but commonly involve incorrect doses, illegible details or ordering inappropriate medications or drugs that may react with other medications already being taken (Haas et al., 2012). However in Saudi Arabia, nurses are not allowed to prescribe medication, and thus a definition which included prescribing would be inappropriate. The next part of this chapter explains nursing in Saudi Arabia in more detail.

## Nursing in Saudi Arabia



This part of the chapter provides an overview of the health care delivery system and nursing profession in Saudi Arabia, thus providing further context for the study. Within this part, an overview of the country of Saudi Arabia is presented, the current system of health services, hospitals, and nursing education, nursing regulations, and the health care providers in Ha'il region of Saudi Arabia are explained. It is necessary to highlight and explain the organisation of the nursing profession including managing medication errors and rules and regulations to deal with these errors in order to comprehend the real life context, in which the research is located, and the wider nursing experience in Saudi Arabia. This contextual foundation will create a ground upon which study findings can be interpreted and presented.

This part progresses under the following headings:

- The country of Saudi Arabia
- Health Services in Saudi Arabia
- Hospitals in Saudi Arabia
- Nursing in Saudi Arabia
- Nursing Education in Saudi Arabia
- Nursing Regulations
- Policies and procedures to manage medication errors in Saudi Arabia
- The health care providers in Ha'il region of Saudi Arabia
- The error reporting system in Saudi Arabia

## **Saudi Arabia**

The Kingdom of Saudi Arabia (KSA) was established in 1932. It is ruled and governed by the Saudi Royal family and the heads of the main administrative functions are usually members of the Royal family. The Kingdom sits within the Middle-East Diaspora of Arabic countries including Egypt, Syria, United Arab Emirates, Oman and Yemen. Recent moves to greater democratic participation reflect careful balancing of tradition and modernity.

The Kingdom of Saudi Arabia is one of the largest countries in the Middle East, with a population of approximately 28.5 million people with an expected population growth to reach 47 million by the year 2020 (Saudi Central Department of Statistics and Information, 2012). Of the current population 29.4% are aged less than 14 years. The majority of people in KSA speak Arabic, and around 98% of Saudis are Muslims. The median age of population in KSA is 21.6; the annual population growth rate is 2.7% (The World Fact book, 2011). Life expectancy in KSA has increased from 52 years in 1970 to 73 and 74 years in 2009 and 2011, respectively; due to improvements in both health and social services (Saudi Central Department of Statistics and Information, 2012). The Kingdom government is divided into thirteen Administrative regions. The region where this study is located is called Ha'il which is located in the north of the country.

## **Health services in Saudi Arabia**

The healthcare system in Saudi Arabia was first initiated through a declaration made by King Abdul-Aziz Al-Saud in 1926 (Albejaidi, 2010). This declaration facilitated the development of clinics and hospitals in major urban centres. Healthcare was therefore not accessible to the entire

population. In 1954, the Ministry of Health was set up in the KSA and was charged with the responsibility of supervising and managing the healthcare facilities. At this time, Saudi Arabia had not fully developed oil as a natural resource. When Saudi Arabia started to benefit from its main natural resource, more of its financial resources were allocated to improving its healthcare system. The Saudi Arabian government implemented this through the setting up of primary healthcare facilities, hospitals and research facilities.

The government of Saudi Arabia has taken the initiative of improving the healthcare system and has been increasing its expenditure on healthcare over the years. As a result of this, the Saudi Arabian healthcare system is ranked 26th in the world, outweighing other major economic countries like Canada and the United States (US), according to statistics cited from the World Health Report (Albejaidi, 2010).

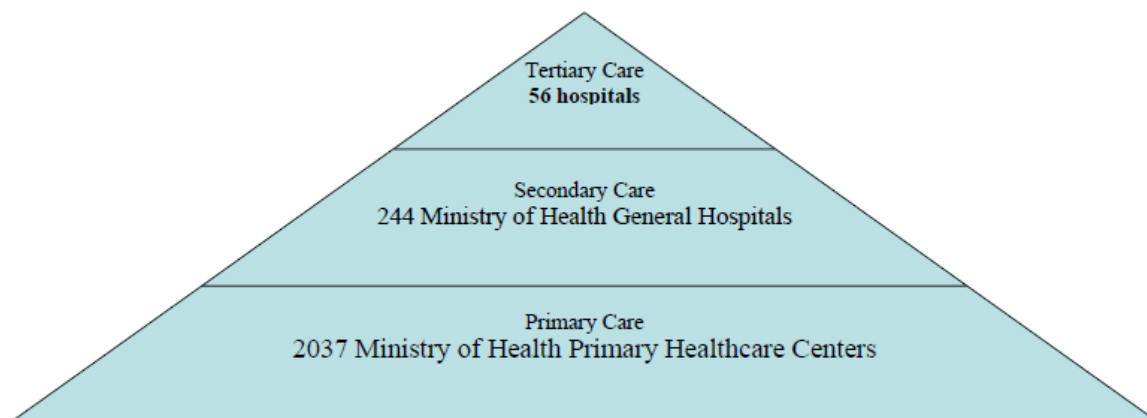
Health services in Saudi Arabia are managed by the government through the Ministry of Health (MOH). The MOH is divided into over 20 administrative divisions and directorates covering major regions and cities in the country. The health care services in Saudi Arabia are well provided for by the government with substantial public funds invested in the provision of these services across the whole Kingdom. Investment in hospitals, private clinics and specialist services has been increasing year by year involving experts from a variety of developed countries around the world, particularly United States of America, the United Kingdom and Canada. Governmental health services are provided free of charge for Saudi people with payment being made only for private health services. The Ministry has a well-established 'Citizen Voice' feedback system for patients and other users of health facilities to improve the system through their comments and suggestions about services.

The Ministry of Health provides 60% of all healthcare services in Saudi Arabia with the other government health agencies providing 20%. These agencies include the Ministry of Defence 8%, Teaching hospitals 7%, National Guard Hospitals 3% and others 2%. The private sector providing the remaining 20% of the total health care offered in Saudi Arabia. The total number of positions in the professions waiting to be filled by Saudis is 22,420 physicians and 53,563 nurses in 2006 (Abu-Zinadah, 2006).

## Hospitals in Saudi Arabia

In Saudi Arabia, the hospital system is classified based on the type of health service it provides and is managed by the Ministry of Health which manages most hospitals through health directories distributed in over the 20 regions (Aboul-Enein, 2002). The Ministry of Health incorporates the main government hospitals which provide health services for Saudi citizens offering comprehensive insurance for Saudi governmental employees. The Ministry of Health is known to be the principal health care provider taking the role of planning, managing and regulating the health care sectors (Ministry of Health, 2002; Mufti, 2000). The other two governmental health sectors are the Ministry of Defence and Aviation sector governing the armed forces hospitals in the country (Armed Forces Hospital in Riyadh), and the Ministry of Interior and the Saudi Arabian National Guard sector. These three sectors represent 13% of total hospitals and 21% of hospital beds. The private health sector makes up 26% of hospitals and 16% of beds. The private hospitals are for-profit health organizations and are managed and run independently often by groups of experts and international cooperatives such as Saudi German Hospital and Saudi British Hospital. The private hospitals follow the rules and regulations set by the Ministry of Health (Mufti, 2000).

Saudi Arabia has also made great efforts in employing the right personnel in its hospitals, sourcing its workforce from across the world. Saudi Arabia, as of 2009, had 56 tertiary care hospitals, 244 general hospitals that are described as secondary care facilities and 2037 primary healthcare centres to serve the citizens and residents of Saudi Arabia (Albejaidi, 2010) (see Figure 1.2).



**Figure 1.2:** Structure of healthcare in Saudi Arabia Albejaidi, 2010, p. 4).

## **Nursing in Saudi Arabia**

The nursing workforce in Saudi Arabia is international and multicultural. The most recent data from the Ministry of Health states that the total number of Saudi nurses working at Ministry of Health hospitals in 2009 was 22,590, which represents 44% of the nurses' workforce. The number of Saudi nurses working at Ministry of Health clinics was 11,872. In the Ministry of Health hospitals, poly clinics and corporate hospitals, the number of Saudi male nurses is 10,469 or 48.3%, whereas female nurses accounted for 11,083 or 51.7% of the total Saudi nursing workforce population at Ministry of Health. In addition, the international nurse workforce was 28,598, representing 56% of the total nursing workforce (Ministry of Health, 2009). This figure contrasts with a more recent study which puts the international nursing workforce at 34% (Alyami, 2014). The international nurse workforce makes a considerable contribution to the healthcare system in Saudi Arabia. However, there are difficulties associated with such a high dependence on the expatriate workforce, the most significant being the very high rate of attrition, culture and training (Baumann, 2010). There are two forms of nurse exodus: internal and external (Al-Hosis, 2010). The internal turnover rate is whereby the nurses leave the nursing department and head to work in another department or division in the same hospital, organization or institution. The external turnover rate is the rate at which the nurses leave working for the hospital to work in other institutions or organizations. This loss of nursing staff has been attributed to a variety of factors (Tumulty, 2001) that can be categorised under work-related attitudes, personal characteristics or external environmental factors. This is partly a result of economic considerations: qualified nurses from sub-Saharan countries, after accumulation of reasonable savings, migrate back home to undertake other economic activities.

During the second Gulf War (1990) many expatriate nurses left the country without notice. This resulted in a staffing crisis that made the policy of "Saudization" a priority. However, Saudization of the profession will take a long time as currently Saudi nationals comprise just 34% of the nursing workforce (Alyami, 2014). *"The high turnover of expatriate staff and low recruitment of Saudi nationals has led to a serious staff shortage in the professions, particularly of well-qualified and experienced nurses. The shortage has lasted more than ten years and that has been due the inability of the nursing profession to attract Saudi male and female nurses to work due to difficulties arising from salaries, shift schedule, management decisions, and social*

*perception of nurses*” (Al-Ahmadi, 2002, p.645). Nursing leaders need to work to improve the image of nurses and facilitate the recruitment of women into the nursing profession. Reduced working hours and part-time contracts with increased salaries and benefits could attract more young women to the profession, as might the provision of facilities such as private transportation and on-site childcare. Furthermore, establishing a national association for nurses would advance the nursing profession and help to ensure that all nurses undertake a fully comprehensive training before entering the workforce (Alyami, 2014).

The nursing board in Saudi Arabia was established in 1986 in order to preserve and advocate for the client and professional rights until the official establishment of the Saudi Commission for Health Specialties in 1993. The Saudi Commission for Health Specialties is a professional/scientific organization with both legal and independent responsibility for health organizations. Their mission is to regulate health practice taking the responsibility to accredit/supervise training programs and their evaluation of trainees in addition to developing appropriate controls and standards for the practice and development of health professionals. The Commission also works through the supervisory boards, councils, for instance the nursing council, committees, executive and professional competence (Saudi Commission for Health Specialties, 2009). The Saudi Commission for Health Specialties provides licensing for members of the health professions in different specialties as well accreditation of health care education programs (Tumulty, 2001b). The Nursing Council in Saudi Arabia is part of and regulated by the Saudi Commission for Health Specialties.

Usually, nursing regulatory bodies and registering authorities are legally authorised to regulate nursing education and practice. In Saudi Arabia, the Nursing Council is the authorized and official nursing organisation that certifies and confirms the employee qualification through examining their certificates and/or through a theoretical examination prior to recruitment. Once the nurse is enrolled in the nursing system in KSA (whether a Saudi national or from elsewhere), a further requirement is to attend a specific 15 hours annual training as continuing professional development in order for the contract renewal of their practice licence.

The goals of the Saudi Nursing Council are to evaluate qualification and accredit degrees or certificates from outside the Kingdom; attend meetings and network with international, regional

and national nursing organizations and conduct national studies to support nursing development (Abu-Zinadah, 2007). The Saudi Nursing Council is currently working with the Saudi Commission for Health Specialties to establish standards for nursing in Saudi Arabia in the next few years. A major accomplishment for nursing in the KSA was the change of entrance requirements to two years of higher education as a prerequisite for all nursing education programs. This change brings Saudi requirements into line with recommendations of the International Council of Nurses for standards worldwide and gives the necessary base for future growth (Tumulty, 2001b).

Saudi Arabian hospitals have a reputation as providers of high salaries to staff, compared to many developed countries (Kline, 2003). It is likely therefore that other factors relating to high turnover are more important. One of the major factors that affect the attitude of staff in the nursing profession is hospital administration. As noted earlier, the organisational valuing of the workforce is at the core of the efficiency and effectiveness of the operations of a hospital. The leadership style utilised by the hospital administration should contribute towards job satisfaction of the staff nurses. Typically, hospital administration manages the staff nurses through the nurse manager or administrator. The actions and decisions made by the nurse managers or administrators directly and indirectly affect the actions and behaviour of the staff nurses. A poor administrative strategy adopted by a nurse manager can lead to frustration among the nursing staff to the point that they choose to leave (El-Islam, 1995). El-Gilany; Al-Wehady (2002) showed evidence of this in a study involving nurses working in hospitals in KSA. Other contributory factors to high turnover include dissatisfaction of the nursing profession, the challenging nature of the work because of obligations, tasks and overwhelming duties. The lack of opportunities to participate in making decisions, some of which may adversely affect the nursing staff, is another often cited reason for dissatisfaction and as such results in feelings of alienation, lack of appreciation and demoralization (Hammoud & Siblani, 2003). All these factors contribute to the low level of job satisfaction among nurses, regardless of whether they are local or international. Hospital administration needs to employ staff retention strategies and thereby effectively and efficiently manage the staff turnover rates in their respective hospitals. In Saudi Arabia, nursing leaders and managers are requested by hospital administrations to identify and understand any potential barriers that may affect the performance of expatriate and Saudi



nurses. Methods and styles of leadership and management are very important for effective leadership, employees, and for the implementation of the health organization's visions and goals. Shukri (2005) who writes about nursing in the Arab world, suggested that over the past ten years in Saudi Arabia, issues relating to nurses' job satisfaction and the nursing profession in general have encouraged a more positive approach by managers towards the retention and education of Saudi nurses.

Turnover and nurse resignations have a significant impact on the nursing shortage in hospital settings. As a result patient ratios increase which leads to a higher work load. As shown in the literature review in the next chapter, a number of studies show that the workload among nurses is considered as a contributing factor to medication errors, therefore it is important to investigate this in the Saudi context.

### **Nursing education in Saudi Arabia**

The status of nursing in Saudi Arabia should be enhanced in order to make it a worthwhile career. The media should engage in helping to promote a positive image of the nursing profession. The education sector should reconsider the length of nursing training (at present 5 years compared with 3 years in many developed countries) while maintaining competent and safe practice. Reducing the financial burden on the nursing student through provision of additional financial support would encourage more students. In particular, nurses should be paid a full salary during the intern year as currently occurs with medical students (Almalki, 2011).

In 1992 junior colleges controlled by the Ministry of Health were established to meet the demand for health professionals. At present in Saudi Arabia there are 25 health institutes and 19 junior health colleges which award diplomas in different fields, one of which is nursing. Although a range of specialist nursing fields are available including midwifery, adult, children and psychiatry in addition to opportunities to practice in many medical areas such as ophthalmic, orthopaedic and critical care; postgraduate courses are offered only in clinical courses such as midwifery.

Al-Swailem (1990) recommended that the obvious shortage of Saudi nurses must be investigated and a solution sought. Yet little research has been conducted in the 25 years since these figures

and recommendations were published (Almalki, 2011; Alyami, 2014). Unfortunately, the problem has not yet been solved but the number of Saudi nurses has increased slightly. Compared to other countries around the world, Saudi Arabia has a serious shortage of health care professionals, especially nurses. As revealed in the statistics survey, the national nursing work force consists of 22% of the manpower available in Saudi Arabia. In this regard, Abu-Zinadah (2006) explained that the Saudi Arabian government's focus was to change the level of the qualified nurses' entry to the profession to be Bachelor of Science in Nursing rather than Diploma. The latter showed that it could take many years to train sufficient number of Saudi nurses to meet the target of 30% of the nursing workforce in Saudi Arabia by 2025. This number is based on predicted Saudi population growth which is estimated to reach 45 million by 2025 (Abu-Zinadah, 2006).

The Bachelor of Science in Nursing (BSN) program was established in 1976 in addition to other health programs in order to increase the number of degree qualifications in the health professions. These programs were under the supervision of the Ministry of Higher Education. *Technical Nurses* and *Technical Specialists* have a Diploma but they are obtained from different institutions which are graded at college or institute level. *Nurse Specialists* have a Degree awarded by a university. Nurses with post-graduate qualifications are referred to as *Senior Specialists* or *Nurse Consultants*, (Aldossary et al., 2008). The Master's Degree in nursing programs in health started in 1987 and initially was available to females only. The Doctor of Philosophy (PhD) program was established in 1994 in cooperation with a British University to facilitate career advancement for Saudi women who are unable to study abroad. A Doctor of Philosophy scholarship program was established to prepare future leaders and nurse educators in international universities abroad (Abu-Zinadah, 2006). It is more convenient for a female Saudi to continue education in Saudi Arabia due to cultural and religious aspects. Government funded scholarships to attend nurse training outside the country have also been used to improve the skills and expertise of the nursing profession. Some non-Saudi education institutions have been invited to set up programmes for female nurses who are unable to travel abroad to undertake training.

In 2006, according to Abu-Zinadah, Diploma holders from health institutes represent 67% and associate degree holders from junior colleges represent 30% (both are at the technical level).

Graduates with Bachelor of Science Nursing (BSN) degrees represented 3% and they are considered as being in the professional and managerial category. There were 28 nurses with a Master's degree and 7 graduates with a Doctoral degree (Abu-Zinadah, 2006). However, the number of bachelor degree graduates and postgraduate nurses and other health professionals may sharply increase as the number of scholarships offered by the Ministry of Higher Education is now increasing, including programmes and funding to enable international post graduate study. These figures reflect the strategy that the Government is aiming to achieve regarding the education of the younger generation to meet future demands.

The Government focuses on aspects of how to face the future challenges and rapid development in all fields including health. There are 23 health institutes managed and supervised by the Ministry of Health (MOH, 2002). These health institutes were divided into: 9 for males and 14 for females by 2002 (Ministry of Health, 2002). The number of health education institutes was reduced from 23 to 4 in 2007. The rest of the health institutes were upgraded to be intermediate health colleges and graduates are considered to be technicians with a nursing diploma (Ministry of Health, 2007). The latest statistics presented by the Director of the Saudi Commission for Health Specialties show that the total number of private health institutes in Saudi Arabia is 106 and only 35 institutes are designated for Saudi females. However, the graduates from these health institutes have different specialties and they are considered to be the lowest in the career hierarchy (Alfurehi, 2007). The number of nursing universities attached to the Higher Ministry of Education was increased in 2007 to five (Ministry of Health, 2007). There seems to be a sharp growth of male and female opportunities from 2002 to 2007 to join the nursing profession with two major programs; diploma and Bachelor. However, the number of high level educational institutions within this period (2002-2007) was still small, and it may take a long time for this number to increase as Alyami (2014) mentioned earlier, Saudi nurses comprised only 34% of nursing workforce and nursing is not considered to be a suitable profession by many Saudi students and the number of those who might supervise training is still small as mentioned earlier in this section (Al-Ahmadi, 2002).

In 2005, the Ministry of Health has formally increased the entry requirement to a BSc degree, and made this the level qualification to join the profession. This is expected to equalise the entry standard with the international level toward improving the quality of nursing care and expertise.

As can be seen, a number of strategies have been implemented to improve the education and qualifications of the nursing workforce. However implementation of these strategies takes time and the majority of the workforce are diploma holders and as such not highly qualified. Within Saudi Arabia, any qualified nurse (including diploma holders) is able to administer medication. As shown in the literature in Chapter two, studies show that a lack of knowledge and skills is one of the contributing factors of medication administration errors. So, examining education as a factor in the causes of errors and nurses perceptions regarding education and medication errors will form a part of this research. There has been huge funding to private institutions that provide training for nurses (over 40 providers). These were accredited by a Vocational Technical organisation but they do not have central standards similar to those of the Ministry of Health.

### **Nursing regulation**

The official regulation of the nursing profession in Saudi Arabia is recent and came from a desire of the Ministry of Health to improve the quality of health care and positive outcomes for patients. This regulation is undertaken by the Scientific Nursing Board, which was established in 2002. Before this time, nurses were not required to register, and training programmes were not standardised or required.

The Scientific Nursing Board has similar functions to regulatory bodies in other countries such as the Nursing and Midwifery Council (NMC) in the United Kingdom or those in the surrounding Arabic countries. The Board has a role to develop standards and approve courses including post-qualification programmes. It is currently run by the Saudi Committee for Health Specialists which has general oversight of all health related professions. One of the differences between the Scientific Nursing Board and the NMC is that it does not require nurses to be indemnified. In the UK, the NMC requires that nurses must be indemnified as part of the requirements for joining the register. It has been suggested that an independent Board should be created for nurses as the current one, which is supposed to support nurses, is mainly focused on the medical profession (Almalki et al., 2011).

### **Policies and procedures to manage medication errors in Saudi Arabia**

The Nursing Standard Policy and Procedures Committee in Saudi Arabia were established in 2008 (Al-Osimy, 2008). This committee included sub committees for general organisation, hospital services, and orientation programs in different nursing disciplines. An important part of

the policies manual was the Occurrence Variance Reports (OVR) (Incident Report). The OVR is a national initiative that aims to provide guidelines for reporting occurrences, and risk situations at the hospital that affect quality of care. It also provides a systematic hospital system through a wide problem identification mechanism for early detection and prevention of issues of concern that may pose risk or adverse patient outcomes and represent a potential hazard to patients, visitors, hospital employees.

The policy states that all Occurrence Variance Reports (Incident Report) shall be handled and maintained in a confidential manner with access to such documentation restricted to authorized individuals. The Occurrence Variance Report shall not be duplicated, with exception of the Quality Management Department, when deemed necessary. The information contained in the Incident Report / Occurrence Variance Report cannot and shall not be used against any individual as the sole basis for disciplinary action. Further, for more confidentiality, hospital staff should not discuss the contents of an Occurrence Variance Report or the event and circumstances relative to the occurrence either with patients, visitors, or other members of the staff, unless clarifying facts with the proper authorities during an investigation. Discussion of general issues with a view to improving patient care, is however, strongly advised but keeping names of involved/concerned staff anonymous with abbreviations and codes used such as PN or RN number. The complete report must then be sent to Quality Management Department no later than 48 hours after the occurrence.

Another part of the Nursing Standard Policy is the Sentinel Event which is defined as, *“an undesirable and usually unanticipated event that involves death or serious physical injury or psychological injury and any event that might cause embarrassment or risk to the hospital with potential legal consequences and/or media inquiries or coverage”* (WHO, 1997). It signifies the need for immediate investigation and response. The Sentinel Event Policy will be followed if an occurrence is determined to be a Sentinel Event. Examples of Sentinel Events are: death related to delay in treatment, medication-error related event, and unexpected death due to causes which may be medication error. Investigations and responses are undertaken by the Quality Department, who provide recommendations to the General Director and ultimately to the health authority legal department who will assess the damage and provide compensation. Actions

which may be taken against nurses include: written warnings, cancelling of licences (so that a nurse cannot practice) and fines.

An important issue to raise here is that nurses are not insured against medication error although insurance is available for doctors. For the patient, who may be harmed, the policy states that compensation should be given to patients depending on the type and degree of damage, for example, organ damage, partial disability, or death. For nurses, this compensation will be paid by themselves, and may prevent nurses from reporting errors for fear of having to pay large amounts of compensation. This is very different to the UK, where the NHS or even private health care providers provide indemnity for nurses which means that if there is a claim against them, they are insured by their employer who will pay the compensation on their behalf.

### **The health care providers in Ha'il region of Saudi Arabia**

The Ha'il region of Saudi Arabia is geographically remote and is situated in the north of the country. It has a unique range of landscapes which has historically provided protection from invaders. But it also means that some infrastructure developments including electricity were difficult to achieve. Economically, the region has relied on support from central government. But recent developments have been started to promote internal and external tourism to the region. There are four main population centres in the region which has a population of 597,144, (Sababhi, 2012), the capital Ha'il, and the cities of Baqaa, Al Ghazala, and Al Shanan. The Ha'il region has 3 main hospitals with a total of 550 beds which include maternity services. There is also a psychiatric hospital with 100 beds and 7 more small local hospitals which provide general health services. Primary care services provide access to general medical care locally. Specialist hospitals for security and national forces are also located in the region. There are four new hospitals under construction which will increase the number of specialist beds by 800 by 2014.

In February 2012, 15 new primary care centres and a maternity hospital were announced for the Ha'il region. At the same time the emergency services radio communications system was completed. This means that remote areas of the region can now contact the expanded ambulance service in emergencies. There are approximately 800 nurses employed at the three hospitals in the region which are the focus of this study. Of these approximately 40% are Saudi nationals with the remaining comprising predominantly Asian and Indian nationals. Other smaller groups represented include English speaking nurses from other countries. Indeed this multicultural

workforce may differ in terms of the way of training as well as their proficiency in English language which is the language of communication in health care settings in Saudi Arabia. That means that the majority of nurses will be communicating in a language which is not their first language. All these factors have potential to impact on medication errors, both in their occurrence and their being reported.

### **Error reporting systems in the Ha'il region of Saudi Arabia**

The three hospitals under study in this thesis use a mixture of computer and paper based systems for error reporting. The nurses in King Khalid Hospital in Ha'il report the incident through software called "Risk Man". Each nurse has a user name and password to allow access Risk Man software. Nurses access the software to provide all the information related to the patient during the incident to the patient and what action is being taken. This information is submitted electronically and directed to the patient safety and risk manager officer. The Patient safety officer will check this and decide how serious the incident is. After that a meeting will be conducted between the patient safety officer, nursing director, quality management director and the staff nurse who reported the incident. The reason behind involving the nurse who reports the incident is not a punishment but to make them aware and conscious about further incidents. During the meeting Root Cause Analysis and brain storming will be conducted and then the team will write a recommendation to a higher authority. In Ha'il General Hospital and Maternity hospital incident reports are paper based. The incident report is submitted to the patient safety officer who will review the incident, after that a meeting will be conducted between the patient safety officer, nursing director and the recommendation will be written to a higher authority. None of the hospitals in Ha'il currently use IT systems such as computerized physician order entry (CPOE) to decrease errors in the prescribing and transcription phases, or bar-coding of medication to reduce medication administration errors.

### **Rationale for the study**

A Delphi study formulated a series of definitions for different errors at the prescribing point of medicine administration in the UK (Dean et al., 2000). This model related to doctors and other prescribers, but no similar studies have been completed and related to nurses although nurses are estimated to spend 40% of their time in medication administration (Armitage & Knapman, 2003). It is also clear that despite the wide variety of health-care professionals involved in the entire

process of prescribing, transcribing, dispensing and administering medication, nurses are more frequently reported to be involved in medication errors than physicians, pharmacists or other health-care professionals (Benjamin, 2003).

In order to advance and promote a safe culture for reporting errors, it is essential that the system is applicable to the health care setting where the patient is being cared for, so that nurses as care providers learn from each other to avoid future errors (IOM, 2000; Reason, 2002). Furthermore understanding nurses' beliefs, values and perceptions about safety culture is important and may help organisations to identify the factors that threaten patient safety, determine the willingness of the employees to report errors and recognise the importance of this, thus improving safety (IOM 2002, Reason, 2002).

There is no previous literature or current research studies in Saudi Arabia that examine either the hospital safety culture or the views of the nurses relating to that culture. This gap could mean that the knowledge and systems surrounding patient safety, and in particular in relation to the nurses' role of medication administration could be compromising patient safety. Furthermore the systems currently in place may not be suited to the beliefs and perceptions of the nurses who work within the system. Understanding this is likely to be the key to improving error reporting systems and ultimately the safety of the patients within the Saudi healthcare system.

Therefore, this thesis presents an in-depth research study to explore and examine nurses' perceptions of the contributing factors of medication administration errors in selected hospitals in Saudi Arabia. The study is expected to generate an evidence base which will inform the development of more focused nursing education based on nurses' perspectives and educational needs, which consequently may assist nurses to report and manage errors across hospitals in Saudi Arabia. As the context of Saudi Arabia is multicultural, each culture with its own beliefs and values, it is crucial to develop a strategy to identify and manage medication errors that suits the beliefs in this country.

Four main objectives were considered to achieve the aim of this study. :

1. To explore nurses' experience of medication administration errors in Saudi Arabia



2. To explore nurses' perceptions on their professional role and responsibility to report and manage medication administration errors.
3. To explore nurses' views about the factors that may influence medication administration errors in hospitals.
4. To examine nurses' perceptions on strategies to promote safe medication administration.

These objectives will enable safety policies and educational programmes to be developed which are informed by the beliefs of the nursing staff. This thesis seeks to provide evidence on nurses' perceptions in avoiding and reporting medication errors with the aim of creating a climate of safe medication administration for patients in different departments. The study will adopt a mixed methodology across different health organisations in Saudi Arabia, combining questionnaires and qualitative interviews to triangulate information with international evidence captured from by systematic review. Given the focus on perceptions, it is important that a qualitative element is included in this study.

### **Importance of this study in the local context**

There are three local reasons why this study is important. First, there is evidence of public concern in Saudi Arabia about medical and medicine errors generally (Shaheen, 2011). Six hundred and seventy medical errors in Saudi Arabia including medication errors by doctors and nurses were reported in 2009 (Khushaymen, 2011), although, given the literature on underreporting (Kim, 2011; Jones, 2010), the accuracy of this figure is not known and the figure may well be higher. Concerns about how to tackle the problem were highlighted by the recent resignation of the head of a hospital in the Ha'il region, (Toumi, 2012). One study has described errors and error reporting amongst doctors working in Saudi Arabia (Alsafi, 2011), but the topic has not been addressed from a nursing point of view. This study will provide the first analysis of the nurses' perceptions in relation to medication errors in Saudi Arabia contributing to a clearer understanding of the situation in a Saudi context.

Second, fear on the part of doctors, pharmacists and nurses, about punishment for errors has been described in many studies in other countries. In Saudi Arabia, doctors have indicated that fear is

one reason why over 45% would not report colleagues' or their own errors (Alsafi, 2011). Recent cases involving medication errors and the prosecution of two Egyptian doctors working in Saudi Arabia who were sentenced in 2009 to 14 years in prison with 1,500 lashes (Amnesty, 2010). They were pardoned after the intervention of the Egyptian President. This study will provide insight to nurses' fears around medication errors. Providing insight in this way will contribute to discussion about openness and accountability and may lead to a reduction in punitive measures and a greater focus on professional development.

Third, the researcher, as part of his job, held the responsibility for professional development in the hospitals in the Ha'il region. In this role he believed he had a moral responsibility to understand the question of medication errors by nurses. This, from his perspective, should enable him to develop professional education and training which should lead to a higher level of patient safety.

### **Impact of study**

Errors occur in Saudi Arabian hospitals as they do in other hospitals around the world. Written reporting is mostly done by the person responsible for the error, and delivered to the supervisor immediately after occurrence of the error. These reports should be handled throughout in a confidential manner with access to such documentation authorised to restricted individuals without retaining it in the patient's record (Al-Osimy, 2008). Error reports are generally addressed through the review process and development. However, the general literature suggests that *perceptions* of nurses about errors are a significant factor in understanding how and why medication errors occur. There is evidence from a number of countries such as United States (Hewitt, 2010; Mahmoud, 2011), United Kingdom (Sanghera, 2007), Taiwan (Tang et al., 2007), Canada (Armutlu, 2008), Korea (Kim, 2011), Malta (Petrova, 2010), Brazil (Bohomol, 2007), Malaysia (Hassan, 2009), Turkey (Karadeniz, 2002), Jordan (Mrayyan, 2007), and Norway (Schelbred, 2007), but there is no published evidence concerning perceptions of nurses about medication errors relating to Saudi Arabia. If perceptions are significant in other countries it is possible that they may also be a factor in Saudi Arabia. Furthermore the perceptions may be influenced by Saudi Arabia's multicultural workforce.

The need and potential way forward for this study is summed up in the following quote

*Human error is pervasive, even among skilled practitioners, and complex systems also generate errors. In order to learn and improve, caregivers need to know that it is safe to discuss mistakes and near misses. Leaders need to create the safe space to have these conversations, model the right behaviors, and act in response to these events for organizational fairness to work. Discussing contributing factors and system thinking helps to identify opportunities and raises awareness among clinicians of system failures that need to be fixed. The ability to openly discuss errors and adverse events internally is a necessity for open, honest disclosure with patients and their families. (Leonard & Frankel, 2012)*

Understanding nurses' perceptions of medication errors and the factors which influence nurses' behaviour in relation to medication errors will help assess the effectiveness of current error reporting mechanisms and in turn inform the development of organisational strategies such as nurse education programmes and medication management policies. The research activity and reporting of this thesis to hospital administration and nurse education departments in Saudi Arabia may help to create a more open culture of discussion on medication errors by nurses and will be a first step in acknowledging perceptions on what may be seen as a challenging national culture. Publication of the findings of this study will bring Saudi Arabia into the same area of shared knowledge with the rest of the world in this field.

## **Summary and conclusion**

This introductory chapter provided an overview of the thesis, the subsequent research study topic, an introduction to the concept of safety culture and patient safety and an overview of the health care system and nursing profession in Saudi Arabia and Saudi approaches to patient safety.

Prior to approaching nurses in Saudi Arabia, about this sensitive topic, it was crucial to be aware or what was already known and what needs to be known about this problem through a comprehensive literature review.

## **Chapter 2: Literature Review**

### **Introduction**

The focus of the study is to investigate nurses' perceptions regarding medication administration errors in hospitals in the Ha'il region of Saudi Arabia. Therefore this chapter provides a review of the literature to provide a further context for the study and identify gaps in current knowledge about the research question (Hart, 1998). The review can also help to identify methods which may be appropriate to the research question. The literature review was undertaken in two phases. The first phase provided a scoping of the literature to give context for the study, identify the gaps in the literature, and establish initial themes for the questionnaire. A systematic review was then performed to provide a rigorous critique on the more recent literature relating to nurse perceptions regarding medication errors. For the systematic review, evidence was searched, analysed and critiqued following a robust approach to highlight and examine the quality of evidence on nurses' perceptions regarding medication administration and medication errors; to explain causes and factors influencing medication errors, and to understand nurses' views on reporting errors. The review also provides evidence on strategies which can minimise or help to avoid medication errors and promote safer medication administration.

### **Scoping review**

The initial scoping search/review comprised a search of CINAHL, MEDLINE and Pub Med. These were chosen because they are recognised as reliable sources of research data in the field of health and nursing. The following search terms were used.

- i. Medication error\*
- ii. Nurs\*
- iii. Perception\*

This resulted in 132 studies, which were screened according to title and abstract for relevance to the topic of nurse's perceptions of medication errors. The screening process reduced the set to 30 studies published between 1994 and 2013. These were summarised within the following themes: causes of medication administration errors, barriers to reporting errors, recommendations, solutions and strategies for improving medication administration. This

collection of studies provided evidence not only on nurses' perspective on medication administration errors but also informed the questionnaire development for this study.

### ***Summary of the scoping review results***

A number of themes are seen in the literature relating to nurses and medication administration errors, which examine medication administration errors from different perspectives. The themes are *perception of errors, contributing factors and barriers to reporting*. There is significant consistency in many study findings. However, the ways that errors are categorised by different studies varies. This has implications for measuring the consistency of study conclusions.

### ***Perceptions of medication errors***

A comparison between a group of 89 qualified nurses and non-qualified nursing aides in Brazil showed that both groups shared similar perspectives about errors (Bohomol and Ramos, 2006). The study used a questionnaire to obtain views of staff. Both grades of staff described similar views about what constituted an error. However, a study of 160 nurses in Taiwan found that the level of medication error judgement was low and not consistent (Lin, 2008). In another study of American nurses, perceptions about medication errors included a sense of guilt by nurses. Some nurses felt they had committed a violation of patient trust, (Jones and Treiber, 2010). In studies of 'near-miss' errors, nurses described personal anxiety about their potential to cause harm to a patient, (Symon, McStea et al., 2006).

When considering error reduction, some studies have assessed the impact of changes to processes on medication administration errors. These indicated that leadership and trust are factors in keeping patients safe from errors (Vogus and Sutcliffe, 2007). Also it has also been shown that risk assessment techniques from non-medical fields can help to reduce errors (Donahue et al., 2009).

### ***Contributing factors***

The literature demonstrates that the process of medication administration is complex. It also suggests that reducing interruptions to the administration process between nurse and patient is an effective way to reduce some types of errors. It has been shown that interruptions to the medication administration activity could affect the number of errors made by nurses (Murphy, 2012). Changing administration processes to avoid interruptions completely has also reduced

errors (Nguyen et al., 2010; Relihan et al., 2010). There is evidence of nurses by-passing processes which interfere with the efficient flow of work, (Halbesleben et al., 2010). Reasons for this included poor information exchange and time required to repeat tasks to avoid errors. New risks to patient safety were identified because of these actions. In a study which used a critical incident technique, 2344 medication administration events were observed in a children's hospital and errors were reported in 36.5% of them (Ozkan, Kocaman et al., 2011). The types of errors were mainly late administration of medication caused by workload and interruptions (Ozkan, Kocaman et al., 2011). Workload and interruption as a cause of medication administration error is also found in other studies, (Heofel, 2008), (Elganzouri, Standish et al., 2009). A study which looked at the accuracy of auditory perception when discussing medications (Lambert, Dickey et al., 2010), found different factors affected accuracy, including background noise and familiarity with medication.

In a quantitative study of Kuwaiti nurses, workload was perceived to have a negative impact on medication safety (Al-Kandari and Thomas, 2009). A random sample of 800 registered nurses (response rate 49%) in America found that 60% of nurses admitted to a medication error within the previous 12 months (Maurer, 2010). Nurses reported that interruptions and long shifts contributed to medication errors (Maurer, 2010). Workload and skills mismatch in staff teams are also reported as causes, (Symon et al., 2006). These themes are also found in an American study which examined nurse perceptions of errors and patient safety, (Mayo and Duncan, 2004). In addition, tiredness and distractions were reported as significant causes of errors and less than half of the nurses believed that errors were reported (Mayo and Duncan, 2004). Petrova also found that tiredness of nurses and distraction during medication administration were the most cited causes of errors (2010).

### ***Barriers to error reporting***

Some studies have found that nurses' perceptions relating to errors may affect incident reporting, (Kim et al., 2011). This study, which took place in South Korea, reported that nurses were concerned about possible punishment. Established instruments for assessment of 'face-concern' and power hierarchy were used. These were deemed suitable because they enabled culturally specific perceptions to be identified. The study found that 63.6% of the nurses involved had been involved in medication errors. But only 28.3% reported these because of fear of punishment.

Similar findings came from another study (Petrova, 2010). In this study of nurses in Malta, self-administered questionnaires were used with anonymous data reporting. Nurses reported that fear of blame prevented reporting errors.

Studies have consistently shown that if nurses fear punishment they are less likely to report errors (Wakefield et al., 1996). This study used factor analysis and reported that fear was a factor which prevented reporting (Wakefield, et al., 1996). In a Turkish study a questionnaire was used to identify nurse perceptions of errors (Karadeniz and Cakmakci, 2002). Participants believed some medication errors were not reported because nurses were afraid of reprisals (63%). The findings are consistent with other studies. Fear of punishment for errors was also a recurring theme in other studies (Chiang and Pepper, 2006), (Chiang, et al., 2010).

The finding of fear as a perceived barrier to reporting errors is consistent over the period of the literature search and across cultures and countries Wakefield, et al., 1996; (Chiang and Pepper, 2006; Symon, McStea et al, 2006; Al-Kandari and Thomas, 2009; Petrova, Balddacchino et al., 2010). This would perhaps suggest that cultural factors (in terms of a nurse's country of origin) may not be a significant influence on how nurses perceive medication errors, rather the barriers may be more associated with the role and function of the nurse or the professional culture of being a nurse. For example, nurses express feelings of guilt for errors, (Jones and Treiber, 2010) and relief for near misses (Symon, McStea et al., 2006).

The geographical range of studies illustrate the global nature of the phenomenon. The majority of studies obtained use questionnaires or survey instruments to collect data, (Al-Kandari and Thomas, 2009; Petrova, Baldacchino et al.. 2010 ; Karadeniz and Cakmakçi, 2002; Jones and Treiber, 2010). There are a number of contributing factors such as highwork load, poor hand writing and lack of knowledge. There is also a high level of fear reported as a barrier to reporting errors. From a methodological perspective, it is possible that questionnaires and anonymity give confidence to nurses to participate and share confidential and sensitive data.

As the search strategy used was not comprehensive in relation to terminology used to describe errors, nor were the resources where error literature could be located, it was important to widen the search to ensure that key literature was not missed. It was also necessary to provide a more critical assessment and synthesis of the literature to underpin and justify the current study. A systematic review of the more recent literature was therefore undertaken and is described below.



Where appropriate (i.e. when they met the inclusion criteria), papers located via the initial scoping review were incorporated and critiqued.

### **Systematic review of nurses perceptions of medication administration errors**

The systematic review aimed to provide a comprehensive review of the literature on nurses' perceptions of medication administration errors. Systematic reviews differ from traditional narrative reviews in that they typically follow a comprehensive and detailed plan with a prioritised search strategy with the goal of reducing bias through clear criteria for identifying, appraising, and synthesising all relevant evidence on a particular topic as well as the quality of evidence in terms of types of studies, types of participants, types of interventions, and types of outcomes measured (Uman, 2011). In other words, a systematic review provides a more rigorous way of identifying and appraising the evidence to provide a more focused plan to develop and contextualise the current study. The objectives were:

1. To assess the methodological quality of the obtained evidence
2. To identify the key findings of the included studies in terms of
  - a. An international view of nurses' perceptions of medication errors
  - b. Contributing factors influencing medication administration errors
  - c. Barriers to reporting medication administration errors
  - d. Potential strategies to minimise medication administration errors.

These objectives were consistent with the objectives for the whole study and were expected to provide a context for the study, provide a deeper understanding of the issues regarding the methods associated with measuring nurses' perceptions and justify the potential unique contribution that the study could make to the literature. The review of available evidence progressed within four stages, in line with those recommended by Greenhalgh et al (1997). These stages are used here to guide the presentation of evidence within the chapter:

- Searching the evidence
- Criteria for considering studies for inclusion in this review
- Evaluating the evidence

- Synthesising the evidence

All types of studies were included and they were searched, evaluated and synthesized utilizing the approach recommended by Long et al., (2002) which included a set of quality checklists for different types of studies; quantitative, qualitative and mixed methods.

### **Searching the evidence**

The searching for evidence used a wide range of databases and search engines. The question guiding the review was what are nurses' perceptions of medication administration errors? The results from the scoping search were used to refine the inclusion/exclusion criteria and identify relevant key words. A variety of electronic databases were examined with six relevant bases that were considered in the current search strategy. Comprehensive searches were then undertaken on the following six databases and additional resources:

- Cochrane Library (Cochrane Database of Systematic Reviews and Database of Abstracts of Reviews of Effects (DARE))
- MEDLINE (medical literature)
- CINAHL (Cumulative Index of Nursing and Allied Health Literature) [1982-2014]
- PsycINFO (psychological literature)
- HMIC (health management literature)
- ISI Web of Knowledge Database (social sciences literature)[1945-2014]
- Google scholar
- ZETOC (Electronic Table of Contents) Database
- PROquest Digital Dissertations (Electronic database for theses)

These databases were selected as they cover a range of perspectives and so were likely to provide a comprehensive set of studies on the topic area within the time period of the study. Searches were undertaken from 2000- February 2014 to obtain the most recent and up to date literature. Literature prior to this date was included in the scoping review and also covered within the reviews located within the prescribed time frame (see table 2.1). The searches were restricted to papers written in English as the initial search demonstrated a lack of Arabic publications on the topic. Furthermore, English is the formal language within Saudi Arabia for both research and practice suggesting that there would be limited evidence written in Arabic for inclusion in the

review. This located a potential 4076 papers for inclusion in this review. In addition to these data sources, the list of references of each reviewed study was also searched for any additional relevant studies.

Initially, studies for the review were selected based on title and abstract and evaluated for relevance following the inclusion/exclusion criteria (see below). The final lists of included studies were then agreed amongst the supervisory team to make sure that they met the inclusion criteria. Full-text papers were obtained for the studies either from the visited databases or through the library Inter-Library Loan service in the University of Salford. The search used these key terms: medication errors, drug errors, medication administration errors, nurses, perceptions. These keywords were developed either from the researcher's experience in the field or from the reviewed studies during the initial scoping review. For each database, thesaurus searching was also used to ensure variations of the keywords, alternative synonyms and related concepts were also retrieved. This ensured that all potentially relevant information regarding the wider concept of medication errors in relation to nurses would be retrieved during the search process. Boolean operators were utilized (AND, OR but avoiding using NOT) to combine concepts, refining the width and depth of the search over steps to capture available evidence. An example of the search history of an individual database can be viewed in Appendix (1). The process of search and inclusion is illustrated in figure 2.1

### **Criteria for Considering Studies for this Review**

A set of inclusion/exclusion criteria was identified from the aims of the study and the initial scoping of the literature. This was discussed and agreed amongst the supervisory team.

## **Inclusion criteria**

### *Types of studies*

The review sought to include studies on nurses' perceptions regarding medication errors, medication administration and medication safety. Studies had to address perceptions, views or beliefs relating to medication administration errors, medication safety, medication error management, contributing factors to medication administration errors and factors that influence reporting medication errors. This could include surveys or any other quantitative or qualitative study design which captured nurses' views or perceptions regarding medication administration errors.

### *Types of participants*

Participants were nurses in all specialties working in health care settings and administering medications for all types of patients. As the focus of the review was regarding nurses' perceptions, studies that included any nurse, whether they had been involved in an error or otherwise were considered appropriate.

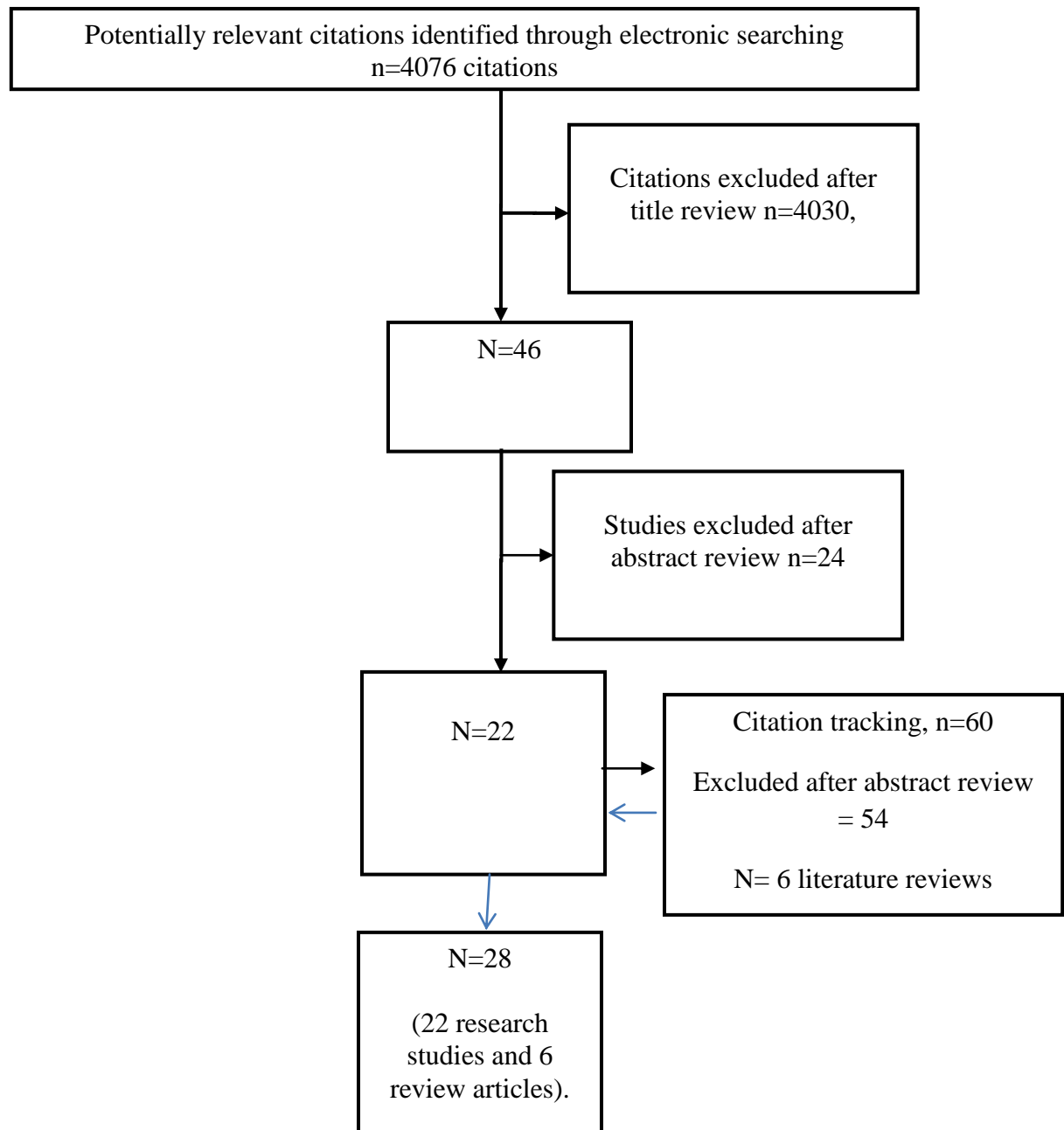
### *Types of perceptions included in this review*

The perceptions were selected as those which reflect nurses' behaviour and attitudes towards reporting medication errors and their perspectives on why these errors happened and what sort of activities they would perform to enhance medication safety. These included nurses' perceptions regarding medication errors, medication administration, reporting medication errors and nurses' roles in managing medication errors. An example of these can be viewed in (Tables 1 and 2).

## **Exclusion criteria**

Studies were excluded from the review if the study was not related to medication administration errors or medication errors involving nurses, for example (managerial tasks), studies published in a language other than English, studies published as a report, book chapter or conference abstract. Studies that were conducted outside hospital settings and focusing on non-nursing staff such as physicians or pharmacists were excluded. To make the review manageable and include the most recent evidence studies that were published before 2000 were excluded. However, themes from

earlier studies were covered via the located reviews and in the scoping review described above. Discussions of methodological studies were also excluded in this review.



**Figure (2.1):** *Overview of Literature search and retrieval*

## **Evaluating the evidence**

### **Selection of studies**

All studies were initially selected based on the title and abstract to meet the predetermined criteria. If the title and the abstract were not clear, the full text of the article was obtained for clarification.

### **Assessment of studies quality**

The assessment of the methodological quality of the reviewed studies was based on evaluation checklists recommended by Long et al., (2002). These checklists included guidelines to evaluate the quality of qualitative, quantitative or mixed method studies. They include questions which guide the user towards an assessment of the quality of the study, e.g. appropriateness of data collection and method of analysis (to what extent were the methods appropriate for the topic under study and how well were they carried out), and accuracy and applicability of results (to what extent researchers in the selected studies believed that their findings would be applied to the context of nursing).

### **Data extraction method**

The quality assessment tools also enable the user to extract items of relevance for the particular review in question. The following details were extracted from all selected studies; core details (including year of publication, first author, title, country of origin, time of study), study introduction/background (including study type, setting, sampling, strategy, drug administration issues studied, definitions of administration error, error reporting, causes and factors influencing reporting errors), results (causes of MAEs), and additional information (including relevance of this information to the aim of this review and current study). Data were extracted independently by the researcher and a sample was agreed with the researcher's supervisor to ensure the quality of the critical appraisal process.

## **Data analysis**

Data analysis is presented in two sections; description of the studies and methodological quality and a synthesis of the evidence.

### **Description of studies and methodological quality**

#### *Studies identified*

The database searches resulted in a list of 4076 citation plus 60 for citation tracking. The inclusion criteria were applied; 4030 were excluded at the title review stage and 24 were excluded at the full text review stage giving a total of 28 items which fulfilled the inclusion criteria. Of the 28 items there were 6 literature reviews, eighteen quantitative studies, two qualitative studies, and two mixed method studies. Ultimately, there were 22 individual studies of all designs that were eligible using the inclusion criteria and selected for the current review (Table 2.2) and 6 literature reviews (Table 2.1). Although a number of quality papers were identified, the search identified a lack of publications on the topic within Saudi Arabia adding to the justification that such a study was not only important but also necessary.

## **Literature reviews**

Six literature review studies were obtained while searching the evidence and have provided wealth of information which underpins and complements the evidence in the current review (Armitage, 2003; Brady, 2009; Evans, 2009; Hewitt, 2010; Keers et al., 2013; Parry, 2015). Although there is some overlap between the reviews, each has a slightly different focus that is relevant to the topic of medication errors (and therefore could include some studies on medication administration errors), but does not duplicate the systematic review described in this thesis. Furthermore five of the six reviews covered were not systematic reviews, and could potentially have missed useful studies. These reviews also include literature prior to this systematic review addressing causes/factors and barriers to report medication errors as well as strategies nurses use to minimize these errors. In Brady (2009) for example, medication reconciliation, the types of drug distribution system, the quality of prescriptions, and deviation from procedures including distractions during administration, excessive workloads, and nurses'

knowledge of medications were all found to influence medication administration and medication errors. Similarly, Armitage (2003) found in his review, contributing factors such as lack of skills, miscalculation, workload, distraction and interruption and quality of prescription. Evans (2009) reported personal causes such as fatigue, tiredness, stress, illegible hand writing and lack of knowledge as influencing errors as well as environmental issues such as noise or busy schedule with high workload. Further, the more recent reviews by Hewitt (2010) and Keers (2013) also confirmed most of these factors and addressed other causes and factors such as failure to follow the five rights of medication administration, failure to follow protocol, confusion between drugs with similar names or similar packaging, confusion regarding infusion devices and miscalculations, length of shift, excessive daytime sleepiness. The systematic review by Keers (2013) provides strong evidence regarding the causes of medication administration errors and concluded that slips and lapses were the most commonly reported unsafe acts in addition to knowledge-based mistakes and deliberate violations. Evans (2009) examined barriers to reporting errors. The commonly perceived barriers of blame and punishment did not encourage nurses to report errors. Keers (2013) concluded that medication administration errors are influenced by multiple system factors, but, if and how these arise, needs to be further investigated.

To minimise errors, Evans (2009) concluded that strategies such as barcode scanning equipment for medication and identification bands, avoidance of using unsafe abbreviations, and adequate incident reporting schemes were helpful to recognise and report errors. The latter also recommended education and training as crucial strategies to deal with errors in nursing practice. Evans also found that double checking and the increased reliance on technology has resulted in less demand for nursing staff to execute medication calculations which therefore decreased their errors (2009).

In summary, among the six reviews, there were five reviews that were not systematic, and this may increase the likelihood of relevant studies being overlooked. These reviews also include the literature published prior to this systematic review and therefore provide a summary of the early literature on the causes, factors and barriers to reporting medication errors as well as providing evidence on nursing strategies to reduce errors. Thus, these reviews provide information which underpin the evidence in the current review. A number of contributing factors were found to be influencing the errors occurrence such as distractions during administration, excessive



workloads, and nurses' knowledge of medications. Slips and lapses were the most commonly reported unsafe acts in addition to knowledge-based mistakes and deliberate violations. Barriers to reporting errors perceived as blame and punishment which did not encourage nurses reporting errors. Strategies such as barcode scanning equipment for medication and identification bands with education and training were recommended as crucial strategies to deal with errors in nursing practice. Further details on these reviews are provided in table 2.1 below.

**Table 2.1: Reviews**

	Date	Author/s	Title/Outcome	Country	Method/sample/ Participants	Aim	Key Findings
1	2015	Angela M. Parry *, K. Louise Barriball, Alison E. While	Factors contributing to Registered Nurse medication administration error: A narrative review	UK	A narrative review. A thematic analysis and narrative synthesis of the factors contributing to Registered Nurses' medication administration behaviour	To explore the factors contributing to Registered Nurse medication administration error behaviour.	Within the environment domain, two key themes of clinical workload and work setting emerged, and within the person domain the Registered Nurses' characteristics and their lived experience of work emerged as themes. Overall, greater attention has been given to the contribution of the environment domain rather than the person domain as contributing to error, with the literature viewing an error as an event rather than the outcome of behaviour.
2	2013	Keers, Richard N.	Causes of Medication Administration Errors in Hospitals: a Systematic Review of Quantitative and Qualitative Evidence	UK	<b>Systematic review 54 studies included</b>  Health care team; nurses and anaesthetists	To systematically review and appraise empirical evidence relating to the causes of medication administration errors (MAEs) in hospital settings.	Slips and lapses were the most commonly reported unsafe acts. Knowledge-based mistakes and deliberate violations. Inadequate written communication (prescriptions, documentation, transcription). Problems with medicines supply and storage (pharmacy dispensing errors and ward stock management). High perceived workload, problems with ward-based equipment (access, functionality). Patient factors (availability, acuity), staff health status (fatigue, stress) Interruptions/distractions during drug administration.
3	2010	Hewitt, P.	Nurses' perceptions of the causes of medication errors: an integrative literature review	USA	Lit Review  Mostly nurses and nursing students	To identify evidence regarding nurses' perceptions of the cause of medication errors and discuss their implications for the nursing profession.	Distractions, failure to follow the five rights of medication administration, failure to follow protocol, fatigue or exhaustion, poor physician handwriting, confusion between drugs with similar names or similar packaging, confusion regarding infusion devices and miscalculations, length of shift, excessive daytime sleepiness

4	2009	Evans, Jennifer  Undergraduate student	Prevalence, risk factors, consequences and strategies for reducing medication errors in Australian hospitals: A literature review	Australia	Literature Review  Nurses and nursing students	To examine medication errors in Australian hospitals from a nursing perspective	Illegible hand writing of prescriptions, distraction and fatigue were the highest contributing factors to medication errors. Unclear prescriptions, high workload, and a busy schedule with many pressures. (noisy ward with many patients) and 'knowledge base' as the three important categories of human error which contributed to medication errors a knowledge deficit or inaccurate documentation.
5	2009	Brady A	A literature review of the individual and systems factors that contribute to medication errors in nursing practice	Ireland	Literature review	A review of the empirical literature on factors that contribute to medication errors	Medication reconciliation, the types of drug distribution system, the quality of prescriptions, and deviation from procedures including distractions during administration, excessive workloads, and nurses knowledge of medications
6	2003	Armitage G	Adverse events in drug administration: a literature review	UK	Literature review	To establish a greater understanding of the local circumstances surrounding adverse events in drug administration	Underreporting happens due to either a lack of appreciation that an error has occurred; the error is not considered serious enough to report. Ten contributing factors for the errors such as miscalculation, lack of skills, workload, distraction and interruption and policy and procedure.

**Table 2.2: Summary of included studies**

	Date	Author/s	Title/Outcome	Country	Location	Method/sample/ participants	Aim	Key Findings
1	2014	Abdar et al	Registered Nurses Perception of Medication Errors: A Cross Sectional Study in Southeast of Iran	Iran	Four educational hospitals	In a cross-sectional study conducted <b>238nurses</b> working within these hospitals were studied. Data were collected using Iranian nurses' medication errors questionnaire.	The purpose of this Study was to determine registered nurses' perception of MEs.	lack of staff to patients ratio, nurses fatigue from hard work, having difficulty to read physician's writing on the patients' file, nurses 'heavy workload and work in night shift were the most common causes of MEs.
2	2013	Al-Youssif et al	Nurses' Experiences toward Perception of Medication Administration Errors Reporting	Saudi Arabia	King Khalid Hospital	Descriptive cross-sectional survey  Convenience Sample of <b>253 nurses</b> Response rate 72.3% 77.1% Females	To assess the input from nurses based on their clinical experiences towards perception of occurrence and reporting of medication administration errors, as well as the extent to which errors are reported on their units	Reasons why MAEs occur and not reported; Disagreement over time-error definition reasons, Administrative reasons, Fear reasons  Medication package reason (63.5) was perceived as the most important factor for reasons of MAEs occur, followed by system reason (51.4), then documentation-transcription reason (47.5) and after that nurse - physician reason (42.8)
3	2012	Unver	Medication errors: perspectives of newly graduated and experienced nurses	Turkey	Military education and research hospital	A descriptive cross sectional study Sample <b>169</b> (87 newly graduated and 84 experienced	This study investigated the perspectives of newly graduated and experienced nurses concerning	The two highest perceived causes of medication errors were nurse exhaustion and nurse distraction. Most medication errors were preventable errors. The reasons for error occurrence and failure to inform co-workers of medical errors were

						nurses) <b>Not clear the gender of nurses</b>	medication errors	examined
4	2012	Toruner	Causes, reporting, and prevention of medication errors from a paediatric nurse perspective	Turkey	Inpatient paediatric wards of <b>4 hospitals</b> in Turkey	A descriptive, cross-sectional study  Sample <b>119 Paediatric nurses</b>	To determine the perspective of paediatric nurses regarding the causes, reporting, and prevention of medication errors	Most common causes of medication errors were long work hours (68.1%) and a high patient/nurse ratio (58.8%). Although the majority of nurses (88%) made use of a medication error notification system, many errors were not reported and nurses cited potential blaming of nurses in case of adverse outcome for the patient (52.95%), loss of trust (50.45%), and fear of disciplinary proceedings (42%)
5	2012	Murphy and While	Medication administration practices among children's nurses: a survey.	UK	Children's hospital	Non-experimental survey design  A self-Administered Questionnaire <b>59</b> from 140 (42%) <b>Childrens' nurses Not mentioned the gender</b>	To investigate the medication administration practices of children's nurses	Interruptions in the medication process, a heavy workload and fatigue were some of the findings that emerged from this study. Inadequate knowledge and skills and a failure to comply with hospital policy were also identified.
6	2011	KIM	Nurses_ perceptions of medication errors and their contributing factors in South Korea	South Korea	<b>Seven hospitals</b> ; four teaching hospitals, two private, one governmental	Cross-sectional descriptive survey  sample <b>220</b> from 7 hospitals <b>Nurses</b> 215 females (97%)	The aim of this study was to identify Korean nurses_ perceptions of medication errors.	(63.6%) of the participants had been involved in medication errors once or more in the past month. Factors included; 99 nurses (45.0%) answered advanced drug preparation and administration without rechecking. Only 13.5% of participants informed patients and their families of medication errors and 28.3% of participants submitted an incident report. Medication errors occurred

								most often during the day-shift.
7	2011	Mahmood et al	Nurses' perceptions of how physical environment affects medication errors in acute care settings	USA	<b>Hospitals in Canada and Sweden</b>	Cross-sectional survey  Sample <b>84</b> / four hospitals  <b>Nurses</b> 80 females 95.2%	Nurses' perception of how the physical environment in hospitals affects medication errors	Physical environmental factors that are potentially problematic in the nursing station area and can lead to medication, documentation and other types of nursing errors; inadequate space in charting and documentation area, lengthy walking distances to patient rooms, insufficient patient surveillance opportunity/lack of visibility to all parts of the nursing unit, small size of the medication room, inappropriate organization of medical supplies, high noise levels in the nursing unit, poor lighting and lack of privacy in nursing stations.
8	2010	Petrova	Nurses' perceptions of medication errors in Malta	Malta	Medical ward in general hospital	Survey - self-administered questionnaire.  Sample <b>43 nurses</b> <b>38</b> response rate 88%	To identify Maltese nurses' perceptions of medication errors, including factors that may contribute to errors, barriers to reporting them and possible preventive measures	The most frequently identified causative factors of medication errors were doctors' illegible handwriting, nurses' tiredness, and distraction or interruption while administering drugs. Participants said barriers to reporting errors were the administration system and fear of blame.
9	2010	Jones	When the 5 Rights Go Wrong. Medication Errors From the Nursing Perspective	USA	Nurses selected from Georgia Board of Nursing	Descriptive - Postal survey – Likert scale with qualitative items <b>Nurses</b> Random 2742 <b>202</b> (8.2%)	Describe nurses' perceptions about how and why medication errors occur and their personal	Illegible or unclear handwriting by the physician (86%), did not follow "5 rights" (77%), high patient-nurse ratio (71%), unclear verbal order (68%), insufficient

						response rate <b>87% females</b>	experiences with medication errors	staffing (68%), nurse incompetence (66%)
10	2009	Lin	Willingness of Nurses to Report Medication Administration Errors in Southern Taiwan: A Cross-Sectional Survey	Taiwan	<b>14 Medical surgical hospitals</b>	cross-sectional study  Sample <b>605 Nurses</b> All females	To explore the prevalence of MAEs and the willingness of nurses to report them.	66.9% of the nurses reported experiencing MAEs and 87.7% of the nurses had a willingness to report the MAEs if there were no consequences for reporting. The nurses 'willingness to report' MAEs differed by job position, nursing grade, type of hospital, and hospital funding
11	2009	Hassan	A study on nurses' perception on the medication error at one of the hospitals in East Malaysia	Malaysia	Hospital	Descriptive cross sectional study  Sample <b>92 staff nurse</b> with 68 (73.9% response rate)	Determine the nurses' perception on medication errors that were related directly or indirectly to the process of administration of drugs.	Incidence of medication error was due to the defect in the organizational system itself and not solely due to the mistakes on the part of any individual
12	2009	Covell	Nurses' responses to medication errors: suggestions for the development of organizational strategies to improve reporting	Canada	1000-bed university health centre located in a large metropolitan city in Eastern Canada	A concurrent mixed-method design Sample of nurses?	To obtain a comprehensive understanding of how nurses respond to medication errors and identify strategies that nurses believe may improve reporting of these errors within hospitals	Medication error reporting may be improved by instituting a problem-solving approach to respectfully manage the event and providing nurses with clear guidelines

13	2008	Armutlu	Survey of nursing perceptions of medication administration practices, perceived sources of errors and reporting behaviours	Canada	316-bed acute care, university-affiliated community hospital, Long-term care and a very large outpatient and family medicine program	Cross-section al study – survey <b>205 nurses</b> responded from 386 and Exclusion: managers and liaisons, ...etc 144 analysed 122 excluded not available on the time of the study <b>Nothing about gender</b>	Systematic Approach to Medication Error Control to review the whole process of medication administration within the hospital and to develop a systematic approach to medication error control	The perceived source of error most often cited was transcription (processing), and the second most frequently cited source was the legibility of handwritten medication orders (prescribing). The results demonstrate no significant difference in medication safety practices or in perceptions of errors by years of experience
14	2007	Sanghera	The attitudes and beliefs of healthcare professionals on the causes and reporting of medication errors in a UK Intensive care unit.	UK	1000-bed UK NHS Trust	Semi-structured interviews  <b>13</b> Health care professional interviews  <b>Gender is not clear</b>	To explore the attitudes and beliefs of healthcare professionals relating to the causes and reporting of medication errors in a UK intensive care unit	Staff identified many contributing factors, including poor communication and frequent interruptions. Organizational factors included lack of clarity on the responsibility of the second nurse's check for medication administration, lack of feedback on medication errors, and a common and accepted practice of administering medication without a complete medication order. Barriers to reporting included administrative paperwork and lack of encouragement by management
15	2007	Schelbred	Nurses' experiences of drug administration errors.	Norway	Hospital, community services and nursing homes	An explorative, descriptive design  In-depth interviews Sample <b>10 nurses</b> out of 13 interviews analyzed <b>All females</b>	To describe the experiences of nurses who had committed serious medication errors	Serious medication errors can have a great impact on nurses, both personally and professionally. Reactions from significant others were central to the final outcome for nurses who made drug errors. They wanted to share their experiences, but this required confidence and trust. Nurses were generally willing to accept responsibility for their errors



16	2007	Mrayyan	Rate, causes and reporting of medication errors in Jordan: nurses' perspectives	Jordan	Teaching, governmental, and private hospitals in Jordan	Descriptive study  Sample <b>799</b> responded (57%) from 1400 and from 22 hospitals  <b>Female 46%</b> <b>Male 54%</b>	To describe Jordanian nurses' perceptions about various issues related to medication errors.	The average number of recalled committed medication errors per nurse was 2.2 Using incident reports, the rate of medication errors reported to nurse managers was 42.1%. Medication errors occurred mainly when medication labels/packaging were of poor quality or damaged. Nurses failed to report medication errors because they were afraid that they might be subjected to disciplinary actions or even lose their jobs
17	2007	Tang et al.	Nurses relate the contributing factors involved in medication errors	Taiwan	Hospital  Not identified for more anonymity and confidentiality.	Mixed Method Focus groups and survey to establish the factors that contribute to medication error <b>Snowball sampling</b> method ( <b>nursing students</b> ) <b>Sample= 72 all females</b> Descriptive Analysis Narrative Statements analyzed by two researchers	Understanding the processes by which nurses administer medication is critical to the minimization of medication errors. This study investigates nurses' views on the factors contributing to medication errors in the hope of facilitating improvements to medication administration processes.	Medical wards & ICU –most common location for medication errors. Older patient combined with complex prescription may result in a higher error rate. Main factors involved in each medication error were believed to be personal neglect (n = 62 86.1%), heavy workload (n = 27, 37.5%) and new staff n = 27 (37.5%). Wrong dose or wrong drug - two leading drug error types. Errors do not result from one single human factor  The limitation: The relatively small sample size and the sampling procedure may have caused a sampling bias
18	2007	Ulanimo et al	Nurses' perceptions of causes of medication errors and barriers to	USA	Hospital	Survey-questionnaire Sample of <b>61 medical surgical</b>	Nurses' perceptions about medication errors and the	Result: Nurse's failure to check patient band, tired, nurse does miscalculation, poor handwriting, distraction, technology decreases

			reporting			nurses (convenience)	effects of physician order entry and barcode medication administration on medication errors	medication errors. Nurses perceived that information technology decreases medication errors. However, medication errors continue to occur despite the availability of sophisticated information technology systems
19	2007	Bohomol, E, Ramos, H.	Perceptions about medication errors: analysis of answers by the nursing team	Brazil	Hospital	Descriptive and exploratory – questionnaire <b>256 professionals</b> with  <b>89</b> analyzed	Opinion if the situations represented a <b>medication</b> error or not, if it had to be communicated to the physician or an incident report	Doubts on how to label the situation as an error and which measures should be taken
20	2004	Mayo, et al	<b>Nurse perceptions of medication errors:</b> what we need to know for patient safety	USA	Acute care Hospital	Self-report survey Method by <b>randomly selected nurses in multiple</b> 5000 from 9000 randomly selected with <b>983</b> responded ( <b>20%</b> ) <b>95% female</b>	<b>Nurses</b> perceptions about the causes and reporting of <b>medication errors</b>	There are differences in the perceptions of nurses about the causes and reporting of medication errors. Causes include illegible physician handwriting and distracted, tired, and exhausted nurses. Only 45.6% of the 983 nurses believed that all drug errors are reported, and reasons for not reporting include fear of manager and peer reactions.
21	2002	Karadeniz	Nurses' perceptions of medication errors.	Turkey	Departments of internal medicine and surgery of University Hospital-300 bed	Descriptive study  <b>27</b> nurses	This study analyses nurses perceptions of medication errors and of their appropriate reporting	Participants believed the main cause of medication errors was nurses' tiredness or exhaustion, while 30% of participants indicated that the main cause was the poor legibility or illegibility of physicians' writing on the doctor's order form. Some medication errors were not reported because nurses were afraid of reprisals (63%).

22	2001	Wakefield,et al	Organizational culture, continuous quality improvement, and medication administration error reporting	USA	Hospital	Cross sectional survey Hospital-based nurses	This study explores the relationships among measures of nurses' perceptions of organizational culture, continuous quality improvement (CQI) implementation, and medication administration error (MAE) reporting	Health care organizations have implemented CQI programs, yet barriers remain relative to MAE reporting
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### *Overview individual studies*

A total of 22 empirical studies were included. These addressed different aspects and issues related to the administration of medications and medication errors; causes of errors, factors influencing reporting errors and potential strategies to minimize medication errors. The studies are summarised in Table 2.2 above.

### *Study designs*

Of the 22 studies, which assessed nurses' perceptions of medication errors in health care settings, how and why medication errors occur and nurses' experiences with medication errors, 17 descriptive survey studies were identified (Wakefield, 2001; Karadeniz, 2002; Mayo, 2004; Ulanimo, 2007; Bohamol, 2007; Mrayyan, 2007; Armutlu, 2008; Hassan, 2009; Jones, 2010; Petrova, 2010; Bohamol & Mahmoud, 2011; Kim, 2011; Murphy, 2012; Toruner, 2012; Unver, 2012; Al-Youssif et al., 2013; Zahra et al 2014). This type of design is a relatively easy method of obtaining information from a sample, and an appropriate method to obtain information about views and perceptions. It is an appropriate method to approach a large number of nurses and provide a wider view of the problem in a shorter time period (Lobiondo-Wood and Haber, 2006), but most of the studies located provided only a limited description without further in-depth explanation, as they used a survey. Two studies used mixed methods to achieve their aims (Tang et al., 2007; Covell, 2009), two studies adopted qualitative designs and conducted in-depth interviews with their participants (Sanghera, 2007; Schelbred, 2007). The strengths here were using mixed methods in which the investigator combine the two methods, quantitative followed by qualitative, obtaining two kinds of data. In addition, this kind of design enables the researcher to present data from two studies, using one to interpret the other and providing a more detailed explanation for the reader (Creswell, 2007). The mixed methods approach to data collection can provide context and explanation which a single method might not provide. For intervention studies, a randomized controlled trial would be seen as high quality evidence according to the evidence hierarchy (Sacks, 1982). As this design seeks to establish cause and effect and reduce bias. However no intervention studies were located for inclusion in the review.

### *Participants*

There were a total of 3893 nurses recruited in the 22 included studies, Only two of the studies selected the participants on the random basis (Jones, 2010; Mayo, 2004), however, the response rate of both of these studies was very low; 20% in Mayo (2004) and 8.2% in Jones (2010), which affects the generalisability of their findings and makes it difficult to have confidence in the evidence provided by them. Apart from Mrayyan (2007), the vast majority of participants in the selected studies were females with range of 87% (Jones 2010) to 100% in Tang et al., (2007). This was also accompanied with inconsistency in sample size and sample characteristics in the included studies as well as small sample sizes in some of these studies (Bohomol, 2007; Ulanimo, 2007; Tang et al.,2007; Hassan, 2009; Jones, 2010; Petrova, 2010; Mahmoud, 2011; Murphy, 2012). Furthermore, the gender factor was not considered for comparison in seven of these studies (Bohomol 2007; Sanghera, 2007; Ulanimo, 2007; Armutlu, 2008; Petrova, 2010; Murphy, 2012; Unver, 2012; Al-Youssif et al., 2013). In two studies the sample was not known (Karadeniz, 2002; Covell, 2009). It is difficult to generalise the evidence from these studies when the characteristics of the participants are unknown, limiting the validity of the findings. It was also clear that male nurses were not well represented in the reviewed studies. In one study nurses' gender was a predictor of reporting errors with female nurses reporting a higher number of medication errors than male nurses (Mrayyan, 2007). Although it is recognised that female nurses represent a higher portion of the nursing workforce (Jones, 2004) and this may account for the dominance of females in the reviewed studies, it is unclear whether there are differences in gender when reporting errors and this is worthy of further investigation.

The inclusion criteria in the 18 quantitative (survey) studies were different. Although there were few restrictions to recruit nurses in the studies, participants' characteristics differed across these studies. For example, Kim (2011) included all nurses in seven hospitals, while Armutlu (2008) and Lin (2009) excluded nurse managers, supervisors, liaison nurses and nurses working in areas where no medications are administered. Nursing students were the participants of the study of Tang et al., (2007); a limitation as these nurses would have lacked experience in comparison to qualified nurses which may have affected their perceptions and experiences. One study included critical care nurses with paediatric nurses and nurses in military education and research hospitals as participants in the study by Unver (2012). The study by Jones et al (2010) included active

registered nurses from the Georgia Board of Nursing without referring to what 'active' meant. Furthermore, the qualitative study of Schelbred (2007) set a criterion for participation where the participant had to have been the main person involved in a medication error event. The latter is a qualitative study with a small sample size which, with the study's other inconsistencies, may make it difficult to draw reliable evidence on the nurses' role to report and manage medication errors. But this study should provide in-depth data on nurses' perceptions and actual experiences of medication errors.

### *Measurement of nurses' perceptions*

All of these studies evaluated nurses' perceptions of factors contributing to medications errors, possible strategies to minimize medication errors and ultimately ensure safe medication administration. However, studies differed in the way perceptions were measured and compared. For example Murphy and White (2012), used a self-administered questionnaire including four main parts; hospital medical policy, medication administration practices, reporting errors, causes of medication errors through items related to personal and environmental causes leading to medication errors. The study compared the findings with nurses' ages and qualifications. Unver (2011), used a questionnaire which measured paediatric nurses' perspectives on medication errors asking questions about rates of medication errors reported to managers, reporting medication errors, nurses' perceived causes of medication errors, and nurses' views on reporting medication errors and scenarios. The latter compared findings according to participants' ages, departments, educational levels, work positions, work intervals, and average hours worked per month and shift. In Mahmoud and colleagues (2011) study, a measure from a literature review was adopted which included physical environment characteristics, problematic and helpful environmental characteristics in the nursing unit (affecting work performance), organisational and physical environmental causes leading to errors, perceived causes and frequency of medication errors. They compared their findings according to nurses' age, job designation, and years of experience. Similarly, Al-Youssif and colleagues' (2013) approached nurses for reasons of why medication administration errors occur and are not reported. Although the study presented valuable evidence and highlighted nurses' issues in medication administration errors, this study compared their findings against different variables such as gender, education, nationality, and work units. This was also different across the rest of the included studies in the

review. This inconsistency in ways of measuring perceptions between studies makes it difficult to compare the evidence, which may affect its reliability and validity. For example, Murphy examined nurses' experiences of the work environment such as interruptions, labelling, and generic/trade name confusion. Unver (2012) compared nursing perspectives for shifts worked, departments, and level of education and monthly overtime. Additionally, Schelbred and Nord (2007) presented their findings without considering personal factors but they studied the impact of managers and other significant people on nurses' behaviour when an error was committed. Furthermore, Mrayyan (2007) also compared nurses' behaviour to commit a medication error but they added shortage of nurses as a factor and talked about patients' safety.

#### *Relevance of studies to review objectives*

Studies in the review were predominantly concerned with nurses' perceptions on issues related to medication errors; causes/factors, reporting medication errors, and strategies to minimise medication errors. Of these studies, nine focused on nurses' perceptions of how the physical environment affects medication errors in acute care settings (Karadeniz, 2002; Mayo, 2004; Bohomol, 2007; Ulanimo, 2007; Mrayyan, 2007; Petrova, 2010; Mahmoud, 2011; Murphy, 2012; Al-Youssif et al., 2013). Eight studies investigated nurses' perceptions on causes, reporting, and prevention of medication errors from paediatric nurses (Tang et al., 2007; Sanghera, 2007; Armutlu, 2008; Kim, 2011; Unver, 2012; Toruner, 2012; Al-Youssif et al., 2013; Zahra et al. 2014). Another four focused on reporting medication errors and asked nurses about their willingness to report medication administration errors (Ulanimo, 2007; Sanghera, 2007; Armutlu, 2008; Lin, 2009). Two studies found that medication error reporting may be improved by setting a problem-solving strategy to manage the event and providing nurses with clear guidelines, education, and feedback to minimise medication errors (Wakefield, 2001; Covell, 2009). However no studies examined all the elements contained in the objectives proposed in this study (i.e. nurses' experiences of errors, reporting behaviours, contributory factors, and strategies) suggesting that the issue has not been examined holistically or comprehensively in the literature.

### *Country of origin*

Studies were located across the world. Six of the included studies originated from the United States (Wakefield, 2001; Mayo, 2004; Ulanimo, 2007; Jones, 2010; Hewitt, 2010; Mahmoud, 2011), two in the United Kingdom (Sanghera, 2007; Murphy, 2012), two in Taiwan (Tang et al., 2007; Lin, 2009), two in Canada (Armutlu, 2008; Covell, 2009), one in Korea (Kim, 2011), one in Malta (Petrova, 2010), one in Brazil (Bohomol, 2007), one in Malaysia (Hassan, 2009), three in Turkey (Karadeniz, 2002; Unver, 2012; Toruner, 2012), one in Jordan (Mrayyan, 2007), one in Norway (Schelbred, 2007), one in Kingdom of Saudi Arabia (Al-Youssif et al., 2013) and one in Iran (Zahra et al., 2014). The international nature of this evidence should provide a useful comparison to the multicultural context of the Saudi Arabian situation.

### *Study setting*

A total of 8 studies were carried out in teaching hospitals (Karadeniz, 2002; Mrayyan, 2007; Armutlu, 2008; Covell, 2009; Kim, 2001; Unver, 2012; Al-youssif et al., 2013; Zahra et al., 2014), 11 in general or unspecified hospitals (Wakefield, 2001; Bohomol, 2007; Tang et al., 2007; Mrayyan, 2007; Sanghera, 2007; Ulanimo, 2007; Hassan, 2009; Jones, 2010; Petrova, 2010; Mahmoud, 2011; Kim, 2011), two in paediatric specialised hospitals (Murphy, 2012; Toruner, 2012), one in a medical surgical hospital (Lin, 2009), two in acute care centres (Mayo, 2004; Armutlu, 2008), and two in community hospitals or nursing homes (Schelbred, 2007; Armutlu, 2008). One study involved a military hospital only (Unver, 2012), whilst another study did not mention the institution from which data originated (Jones, 2010), however, because they reported MAE data from inpatient settings, it was assumed that they had originated from a hospital environment. Four studies were carried out in a range of clinical settings that included hospitals of various types (Karadeniz, 2002; Schelbred, 2007; Armutlu, 2008; Lin, 2009). Two studies were conducted solely on paediatric units (Murphy, 2012; Toruner, 2012). Twelve studies were carried out involving nurses working in adult specialities (Covell, 2002; Karadeniz, 2002; Mayo, 2004; Mrayyan, 2007; Sanghera, 2007; Schelbred, 2007; Armutlu, 2008; Lin, 2009; Petrova, 2010; Kim, 2011; Al-Youssif et al., 2013; Unver, 2012). One study used a multi professional team including nurses (Bohomol, 2007). It should be acknowledged that nurses in different situations and settings around different cultures and countries may react to medication errors differently following different rules, regulations, and organisational and national values.



This diversity of settings with different nurses' perceptions might influence the unity and the reliability of the evidence necessitating the need for further research in a different culture like Saudi Arabia with its own beliefs and values.

## **Synthesising the evidence**

Once the data was extracted and the papers critically appraised, summary tables (2.1; 2.2) were used to facilitate the synthesis of evidence into themes which aligned with the overall study objectives. These included nurses' perceptions of medication administration errors; factors contributing to the errors; reporting the errors; and strategies to minimize the errors in nursing practice.

## **Nurses' perceptions of medication errors**

Twenty studies in the review addressed nurses' perceptions in medication errors and possible factors that influenced their perceptions on dealing with medication errors worldwide, these were; tiredness and exhaustion, miscommunication, heavy workload, lack of checking and other factors (Karadeniz& Cakmakçi, 2002; Mayo &Duncan, 2004; Tang, et al.,2007; Schelbred,2007; Sanghera, 2007; Mrayyan, 2007; Ulanimo, 2007; Armutlu, 2008; Covell, 2009; Christine, 2009; Hassan, 2009; Petrova, 2010; Jones, 2010; Kim, 2011; Mahmoud, 2011; Toruner ,2012; Unver, 2012; Murphy, 2012, Al-Youssif, 2013; and Zahra et al., 2014). These factors fall into three main categories according to Reason's model (1997); active failure, local conditions, and latent failures. This model is described in more detail in Chapter 3. Table 2.3 summarises the contributing factors of medication errors according to these concepts which are described in more detail below. The model is adopted to include individual and team factors under the heading of Situational factors (Lawton, 2012).

## **Active failures**

Active failures are slips, lapses, mistakes and violations committed by human operators at the sharp end of operations (Reason, 1997) close to the event itself such as nurses. The systematic review by Keers et al., (2013) shows a number of contributing factors matching Reason's description of active failures. Latter found Slips and lapses were common in the majority of the studies. Lack of concentration and carelessness were also reported in three studies of his review.

Furthermore, a study by Kim (2011) reported several factors of medication errors such as unfamiliarity with medications (45.5%). This led to a miscalculation of dosage (69%), inability

of junior nurses to confidently challenge more senior staff (66%) and furthermore, a study by Unver (2012) also showed that lack of documentation and drug calculation were associated factors leading to medication errors. Tang (2007) found that “personal neglect” was perceived as the highest contributing factor to medication administration errors.

### **Situational factors**

Seven studies found the physician’s unclear, poor or difficult-to-read writing as a major factor of medication administration errors (Karadeniz, 2002; Mayo & Duncan, 2004; Tang et al., 2007; Ulanimo, 2007; Mrayyan, 2007; Armutlu, 2008; Jones, 2010; Petrova, 2010; Murphy, 2012). In a study by Maryanne (2007), poor communications across the multidisciplinary team (nurse, pharmacist, doctor) was common (71%). Tang et al., (2007) described one reason as a complex prescription that might not be understood easily by nurses so they could administer the medication safely. The study of Petrova (2010) reported the illegibility of physicians’ handwriting as common, followed with the tiredness and exhaustion of nurses. In this study, the author reported that these factors were part of poor communications between members of the healthcare team. This study also seemed to consider poor communication as the factors most likely to contribute to the occurrence of medication errors. More recently two studies, found miscommunication while conveying verbal orders (Kim, 2011) (38.2%); Murphy (2012) considered miscommunications (34.1%) were also contributing factors to medication errors.

### **Local conditions**

Local conditions refer to workplace conditions and emphasise that the environment where people are working can provoke active errors and violations (Reason, 1997). The study by Petrova (2010) also found that nurses’ distraction by patients, co-workers, or visitors is also a factor. In Mayo and Duncan (2004) heavy workload was reported as common causes of medication errors. The study by Tang and colleagues (2007) in Taiwan found that factors like solving other problems while administering medications, heavy workload, and change in ward were contributory to errors. Kim (2011) and Murphy (2012) showed that nurses referred to work overload and advanced drug preparation and administration (45.0%) as common factors. Workload was found to contribute to distractions which lead to errors in intravenous administration (Keers et al., 2013). In the latter study a shortage of staff was found to be a

contributing factor as well as interruptions/distractions in sixteen studies. Five studies (Karadeniz and Cakmakci, 2002; Ulanimo, 2007; Petrova, 2010; Unver, 2012; Murphy, 2012) found that tiredness and exhaustion due to working long hours as reported in Jones (2010) and Toruner (2012) in which more than 70% of nurses worked for long hours with a high patient/nurse ratio. Unver (2012) found that nurses perceived the three most common causes of medication administration errors to be local conditions which comprised of; distraction by other patients, co-workers, or events on the unit. Mahmood (2011) stated high noise levels in the nursing unit as one of the factors influencing errors occurrence.

### **Latent conditions**

Latent conditions are a result from the decisions of system designers, procedure developers and managerial control over time (Reason, 1997). Murphy (2012) presented factors such as not having adequate time to spend with patients and parents when administering medication (46%). Sanghera (2007) found factors included lack of clarity regarding the responsibility of the second nurse's check for medication administration, lack of feedback on medication errors and a common and accepted practice of administering medication without a complete medication order were the main perceived causes of errors. The study by Murphy (2012) presented individual or personal factors as lack of training on medication administration (43%). These findings supported those in Jones (2010) and Bohamol (2007) who found that being a new employee and having a lack of experience and/or training were contributory factors. A study by Mahmood (2011) explored the relationship between aspects of the physical environment and medication errors. The study compared other environmental factors to medication errors that are potentially problematic in the area of the nursing station which can lead to errors in medication, documentation and other types of nursing errors. These include inadequate space in the charting and documentation area, lengthy walking distances to patient rooms, insufficient patient surveillance opportunity, lack of visibility to all parts of the nursing unit, small size of the medication room, inappropriate organization of medical supplies, poor lighting and lack of privacy in the nursing stations. Interestingly, these findings were also supported by the study of Al-Youssif and colleagues (2013) in Saudi Arabia (the country of the current study) with correlations on the frequency of errors and factors contributing to errors, the latter study found

significant findings in relation to high level of noise, poor lighting, missing or unreadable labels, lack of documentation, lack of supplies and calculation errors. The wrong time of administration was found in a more recent study in Saudi Arabia to be associated with the location of medication room, size of medication room, and unreadable labels (Unver, 2012).

The literature finds that in line with Reason's (1997) and Lawton's (2012) model, nurses' perceptions of factors which contribute to medication administration errors fall into the categories of active failures, situational factors, local conditions and latent failures. Although there are commonalities amongst the factors reported, there are no factors that appear to be more significant than others. It is also worth bearing in mind that some studies only examined one concept (local conditions for example). This suggests that either there are different factors which are more important in different countries or each error is caused by multiple factors in line with Reason's organizational accident model (1997) and Lawton's model (2012).

**Table 2.3: Summary of contributing factors of medication errors reported by the included studies**

	<b>Author/date</b>	<b>Active Failures</b>	<b>Local conditions</b>	<b>Latent condition</b>
1	Zahra et al 2014	√	√	√
2	Al-Youssif et al 2013		√	
3	Unver 2012	√	√	√
4	Toruner 2012			√
5	Murphy M and While A 2012	√	√	√
6	Mahmood, Atiya 2011		√	√
7	KIM 2011	√	√	√
8	Jones 2010	√		√
9	Petrova E 2010	√	√	√
10	Covell 2009			
11	Hassan H; 2009			
12	Lin 2009	√		
13	<u>Armutlu M</u> ; 2008	√		
14	Ulanimo VM 2007	√		√
15	Tang et al. 2007	√	√	
16	Mrayyan 2007	√		
17	Bohomol 2007	√		
18	Sanghera 2007	√	√	√
19	Schelbred 2007			
20	Mayo, A.M., et al 2004	√	√	
21	Karadeniz 2002	√		√
22	Wakefield 2001			

## **Barriers to reporting medication administration errors**

Although nurses sometimes considered reporting errors to their managers or even other nurses, actually reporting these errors was a major concern for other nurses due to a variety of reasons related to nurses themselves or their organization. Of the reviewed studies, 12 discussed issues related to reporting medication errors (Karadeniz, 2002; Mayo, 2004; Mrayyan, 2007; Ulanimo, 2007; Schelbred, 2007; Hassan, 2009; Petrova, 2010; Kim, 2011; Toruner, 2012; Murphy, 2012; Unver, 2012; Al-Youssif, 2013) with personal and/or organisational reactions being the most common reasons for not reporting errors. Two studies reported both personal and organisational reasons (Petrova, 2010; Al-Youssif, 2013) (see table 2.4).

### ***Knowledge and experience of reporting***

A study by Mayo (2004) was one of seven studies that addressed the barriers to reporting errors and found that less than half of the nurses believed that all drug errors were reported to a nurse manager using an incident report. Most nurses indicated that they knew what constituted a medication error (92.6%) and when to report an error using an incident report (91.3%). The main reasons for not reporting errors in this study were “afraid of manager’s reaction” (76.9%) and “afraid of co-workers’ reactions” (61.4%). More recently, a study by Petrova (2010) showed that nurses believed that they could be blamed if they reported that errors had occurred. There was a slight difference between nurses regarding those who disagreed and those who agreed that a medication error was not important. One year later, Kim (2011) in Korea found that only 13.5% of participants informed patients and their families of medication errors and only 28.3% of participants submitted an incident report. Later in support of Mayo (2004), Unver (2012) found that more than half of nurses from all groups did not report the medication errors because they were afraid of supervisor nurses’ reactions. There were 81% of experienced nurses compared to 57% of newly graduate nurses who did not report some of the drug errors because they were afraid of their colleagues’ reactions. Overall, the majority of nurses scored 10-20% in error reporting (17%) from both new graduates and experienced nurses. Parallel to this study in the UK, Murphy and While (2012) found that about 69% of nurses reported medication errors, however, little feedback (either written 11% or oral 28%) was received by these nurses that was described as being beneficial for their practice. The findings in this later study were far different

to those by Kim in Korea (2011) who showed a higher rate of those who reported errors than Murphy and While (2012).

Reporting systems are dependent on the nurse's ability to recognise an error has occurred, belief that the error warrants reporting, belief that she/he has committed the error, and willingness to overcome the embarrassment and fear of retaliation for having committed a medication administration error. Failure to administer a medication is the most underreported error because nurses perceive that patients will not be harmed in this situation (Kim, 2010). The literature suggests wide variations in error reporting, potential under reporting of errors and differences in perception in what constitutes an error. These variations occurred between studies from a wide range of countries which indicates that it could be the culture which may be factor influencing reporting medication errors, and this makes the current study necessary as its base comes from a different culture.

### ***Fear***

Fear of disciplinary reaction and punishment was considered the most common reason for not reporting medication error in seven of the reviewed studies. This is supported by Karadeniz and Cakmakci (2002) who found 63% of nurses believed that fear of punishment for errors as another reason for not reporting. Fear of punishment for errors is a recurring theme. Schelbred (2007) also found that serious medication errors can have a great impact on nurses, both personally and professionally. Reactions from significant others were central to the final outcome for nurses who made drug errors. In Mrayyan (2007) and Al-Youssif et al., (2013), nurses failed to report medication errors because they were afraid that they might be subjected to disciplinary actions. An earlier study by (Kim et al., 2011) in South Korea who reported that nurses were concerned about possible punishment and found that 63.6% of the nurses involved had been involved in medication errors. Only 28.3% in this study reported these errors because of fears of punishment.

There was a correlation between levels of concern about power and face-saving and the number of barriers which nurses identified to reporting errors. Similar findings came from another study



by Petrova (2010). Further, Petrova (2010) and Toruner (2012) also found that more than third of nurses were concerned and afraid of disciplinary proceedings causing nurses to have loss of trust (50.45%) with their managers.

### ***Lack of effective systems***

Participants in Petrova (2010) said that barriers to reporting errors were the administration system and fear of blame. Indeed, fear of blame was attributed to defect and error in the organizational system itself and not solely due to the mistakes on the part of any individual (Hassan 2009). A study by Murphy and While (2012) in the UK showed that about 69% of nurses reported medication errors, however, little feedback (either written (11%) or oral 28%) was received from their organization. Lack of feedback made nurses hide errors believing that feedback was beneficial to avoid future errors and consequently important to improve their practice. A study conducted by Ulanimo (2007) in the United States of America identified barriers to reporting which were related to the organisation and they included: lack of policies, procedures, and unit routines; busy unit; nurse's negligence.

Fear was a recurrent theme in the reviewed studies; however, it was widely different across these studies. The inconsistency of these findings and the contextual factors relating to fear outlined in the introduction and the lack of insurance for nurses in Saudi Arabia, suggest that fear is an important issue to examine in a Saudi Arabian context. This may help create a safer environment to encourage nurses to report their errors

### **Facilitators to reporting**

The aspects which facilitated report of errors included: understanding and supportive supervisors and physicians, involvement of nurses and clinical nurse specialists in determining medication errors, having enough time to discuss and talk to the manager, and having a manager who followed through on disciplinary action when a nurse frequently made errors

**Table 2.4: Summary of barriers to reporting medication errors**

	Author/date	Fear	Knowledge of reporting	Organisational reactions
1	Zahra et al 2014			
2	Al-Youssif et al 2013	√		√
3	Unver 2012	√	√	
4	Toruner 2012			√
5	Murphy M and While A 2012	√	√	
6	Mahmood, Atiya 2011			
7	KIM 2011	√	√	
8	Jones 2010	√		
9	Petrova E 2010	√	√	√
10	Covell 2009	√		
11	Hassan H; 2009			√
12	Lin 2009			√
13	<u>Armutlu M</u> ; 2008		√	
14	Ulanimo VM 2007	√		
15	Tang et al. 2007			√
16	Mrayyan 2007			√
17	Bohomol 2007	√		
18	Sanghera 2007			√
19	Schelbred 2007			√
20	Mayo, A.M., et al 2004	√	√	
21	Karadeniz 2002			√
22	Wakefield 2001	√		√

## **Strategies to minimise medication errors**

It is clear that medication administration errors continue to occur even with the availability of sophisticated information technology systems designed to decrease errors (Ulanimo, 2007). Therefore strategies to minimise these errors might be not only focused on the organisation but also the nurses. Eleven studies in the review suggested several strategies to minimise medication administration errors related to nurses and their clinical settings (Schelbred, 2007; Sanghera, 2007; Mrayyan, 2007; Armutlu, 2008; Covell, 2009; Petrova, 2010; Jones, 2010; Kim, 2011; Mahmoud, 2011; Murphy, 2012; Al-Youssif, 2013). A study by Covell (2009) aimed to obtain a comprehensive understanding of how nurses respond to medication errors and identify strategies that nurses believe may improve reporting of these errors within hospitals. The study showed that medication error reporting may be improved by instituting a problem-solving approach to manage the event and providing nurses with clear guidelines, remedial education, and timely feedback. Additionally, a study by Kim (2011) showed that nurses thought that the three most effective strategies for preventing medication errors would be continuous monitoring of adherence to the 5 Rights of medication administration (62.5%), reducing tiredness through ensuring reasonable length of shifts and giving breaks (58.3%), and preparing and administering the medication by the same nurse at the same time (44.0%). Furthermore, a study by Jones and Treiber (2010) found that nurses often recounted how the mistake was made early in their nursing career. Inadequate knowledge and skills, and a failure to comply with hospital policy were also identified (Murphy, 2012).

Overcoming lack of knowledge is not only an individual but also an institutional responsibility. As can be seen in table 2.5 training was the most common recommendation throughout the literature. Strategies from other studies included modification in the physical environment (Mahmoud 2011), nursing education on medical safety (Mrayyan, 2007), increased staffing and avoiding distractions from patients and co-workers, managerial support and an active role for the regulatory body to provide information on nurses' rights (Schelbred, 2007), and feedback on medication errors (Sanghera, 2007). Furthermore, Ulanimo and colleagues (2007) found that Physician Order Entry (POE) and Barcode of Medication Administration (BCMA) were also effective in minimising medication errors. Eighty per cent of nurses involved in this study

responded that they had not made any medication errors, with 12% of nurses remembering making only one error after these technological systems were first implemented (Ulanimo, et al., 2007). Table (2.5) shows a summary of perceptions of possible strategies used to minimise errors.

**Table 2.5: Summary of strategies to minimize errors**

	<b>Strategies/Author/ Date</b>	KIM 2011	Covell 2009	Murphy 2012	Jones 2010	Al-Youssif 2013	Armutlu 2008	Mahmoud 2011	Mrayyan 2007	Petrova 2010	Sanghera 2007	Schelbred 2007
1	Instituting a problem-solving approach		√			√						
2	Clear guidelines		√									
3	Remedial education		√									
4	Timely feedback		√									
5	Monitoring of adherence to the 5 Rights of medication administration	√										
6	Nursing staff aid through ensuring reasonable length of shifts	√								√		
7	Giving breaks	√										
8	Preparing and administering medication by same nurse at same time	√		√								
9	Training and education are recommended regardless of years of			√		√	√			√		√

	experience											
10	Establish/Comply with hospital policy				√				√			
11	Modification in physical environment							√				
12	Nursing education on medication safety								√			
13	Staffing, avoiding distractions from patients and co-workers									√		
14	Managerial support, role of regulatory body to provide information about rights											√
15	Feedback on medication error										√	

## **Discussion**

This systematic review has emphasised nurses' awareness that the incidence of medication errors is a frequent event, harmful to patients or nurses and increasing the costs to the healthcare delivery system. The evidence from this systematic review demonstrates that nurses responsible for the preparation and administration of medication are prone to making errors, but these errors have resulted from factors related to both nurses and organisations, in line with Reason's (1997) adopted model of active and latent failures and local conditions. One of the strengths of this systematic review was that it was developed to search a variety of data sources to obtain more comprehensive evidence on nurses' perceptions regarding medication administration errors.

Studies in the review lacked consistency in terms of the method(s), settings and definitions they used. Although their aims were similar, they differed in the way they measured the concepts and the type of participants as well as sample size. This inconsistency created differences in the types of data generated pertinent to the themes identified regarding to causes, factors and reporting of medication errors. Only a small proportion of included studies predominantly sought to determine the causes of medication errors and only two of these used mixed methods (Covell, 2009; Tang et al., 2007) two others used qualitative methods (Sanghera, 2007; Jones et al., 2010) to further explain issues in more detail. All other studies used quantitative methods and can be criticised for focusing on studying the frequency or factors quantitatively without considering any clarification of nurses' points of view (Tang et al., 2007).

In addition, studies that utilised quantitative methods alone did not allow sufficient flexibility to explain why such factors are related to medication error in order to provide any explanations of causal relationships (Mrayyan, 2007; Bohomol, 2007; Armutlu, 2008; Hassan, 2009; Petrova, 2010; Kim, 2011). Given the evidence that errors can arise as a result of multiple and interacting factors, this evidence may need further explanation of the nature of these factors and consequently require more methodological flexibility to provide sufficient details on medication administration errors.

Despite the above inconsistencies in the reviewed studies, important factors relating to medication errors were identified. Fear of punishment was the greatest barrier to reporting

whereas tiredness and exhaustion were the most common factors to contribute to errors, followed by miscommunication, heavy workload and lack of checking the medication or patient. These factors were also accompanied by the presence of distractions and confusion with drug names/packages. The lack of knowledge and training on medication errors reported in the review appears to be a well-recognised contributor to medication errors (Kim, 2011), which warrants further investigation.

Physician's unclear, poor and difficult-to-read writing was also a concern for nurses (Karadeniz, 2002; Mayo & Duncan, 2004; Tang et al., 2007; Ulanimo, 2007; Mrayyan, 2007; Armutlu, 2008; Jones, 2010; Petrova, 2010; Murphy, 2012). Electronic or printed prescriptions may alleviate this problem and minimise medication errors (Ulanimo, 2007). Therefore, it is essential to examine this as a potential solution to manage medication administration errors.

A high workload is linked to fatigue and can lead to interruptions/distractions which can then increase medication errors especially for inexperienced nurses (Murphy, 2012). More evidence is therefore required to explore the role of workload in medication error causation. Studies have linked workload to nurses' ignorance and neglect (failure to meet the standard of care) (Tang et al., 2007) but this relationship is not well understood, and further study is required to understand more clearly how medication administration errors could be influenced by these factors.

Culture was of great influence in reporting medication errors and studies referred to individual and group values and attitudes (Wakefield, 2001; Sanghera et al., 2007). The nature and influence of culture on medication administration error is still not well explained in these studies. Interestingly, a study in Saudi Arabia found that nationality was a factor which highly influenced the occurrence of errors and not reporting those errors (Al-Youssif et al., 2013). This justifies further study amongst the multicultural Saudi nursing workforce as they come from many different cultures, each with its own values and beliefs on responding to error, working in organisations with their own rules and regulations (organisational culture).



## **Limitations of the review**

The majority of included studies were quantitative surveys that used different measuring tools which may create self-reporting bias. The surveys also measured different concepts making comparisons difficult across studies. The quantitative surveys did not provide detail on the complex nature of the issue of medication administration errors. Only two studies were qualitative and provided a more in-depth approach however they were ungeneralizable and the researcher considered they had an effect on interpretation. The mixed method in which the investigator might combine the two methods, quantitative followed by qualitative, can be difficult for a single researcher to carry out. Implementing both qualitative and quantitative method is more expensive and is more time consuming (Creswell, 2007). This systematic review also excluded non-English publications which may create a publication bias and miss a more detailed cultural perspective on medication administration errors and reporting them. Despite this, this review was able to compare studies from different methodologies using a systematic appraisal process identifying the important areas for further research and potential interventions to minimise medication administration errors in present health care settings.

## **Conclusion**

This systematic review has demonstrated that nurses perceive that medication administration errors are caused by a wide range of factors, which can be categorised as active failures, situational factors, local conditions and latent failures. However these factors may vary in significance in different cultures. This corresponds with a systematic review of empirical evidence of the causes of medication errors, which found that most are influenced by multiple system factors (Keers, 2013). Perceptions are complex to measure, but as most studies in the review have used a survey approach they have not sufficiently explored the complex nature of medication errors. Furthermore, although the issues to be covered in this study have been studied in the literature, no study examines all the relevant issues necessary in building safe medication administration such as reporting, contributing factors, and strategies to overcome errors.

Only one study was found from Saudi Arabia. This used a quantitative approach only, took place in one hospital and only examined barriers to reporting errors and contributory factors to errors, and therefore does not provide sufficient detail regarding the views and beliefs of nurses in Saudi Arabia. As noted in the introduction, it is important to understand the views and beliefs of nurses in order to build an effective safety culture. This lack of evidence

relating to Saudi Arabia and the finding that there is variety of beliefs between cultures confirms a need to undertake an in-depth study of nurses' perceptions of medication errors in Saudi Arabia. According to Keers (2013) further research with a theoretical focus is needed. The next chapter outlines the theoretical framework and methods used to investigate nurse's perceptions of medication administration errors in a Saudi Arabian context.

## **Chapter 3: Methodology**

### **Introduction**

This chapter explains the theoretical frameworks underpinning the study and presents details of the methodological issues and techniques which were applied to answer the research questions, as well as their justification. This chapter describes the nature of both quantitative and qualitative approaches, and the mixed methods approach chosen to address this research aim. This is followed by the justification for adopting a mixed method approach, considering cultural and ethical issues in this research. The phases are then explained with the quantitative phase providing an overview of the questionnaire characteristics, population and sample, data collection methods, instruments descriptions, instrument translation, pilot study, research procedure, data management, and the data analysis phase. The qualitative phase is also explained including pilot and practice interviews, recruiting the interviewees and qualitative data analysis. Thirdly, the data integration phase is presented and finally the rigor of the quantitative and qualitative research.

### **Aims and objectives**

The aim of this study is to investigate nurses' perceptions medication administration errors in hospitals in the Ha'il region of Saudi Arabia. The objectives are:

1. To explore nurses' experience of medication administration errors in Saudi Arabia
2. To explore nurses' perceptions on their professional role and responsibility to report and manage medication administration errors.
3. To explore nurses' views about the factors that may influence medication administration errors in hospitals.
4. To examine nurses' perceptions on strategies to promote safe medication administration

## **Theoretical framework**

The aim of modeling is to clarify concepts. It is important to keep the research question or the aim of this study in mind when selecting a model and use it in relation to this context.

There is a rich source of literature on human error and its role in accidents. The human error literature has been very much inspired by the work of Reason (1997) who developed the Swiss cheese and Organizational Accident Model. Since the 1990s these have gained widespread acceptance and use in healthcare. The Swiss Cheese model of accident causation is a model used in risk analysis and risk management, including aviation, engineering and healthcare.

### **Human error theory**

According to Reason, it has been claimed that human error is involved in 80-90% of all major accidents (1997). One assumption of James Reason's system approach is that where humans are involved, errors will occur. Based on published evidence on human cognition by Rasmussen, Reason (1990) considered origins in human cognition to classify human errors. He first defined human error as a generic term to encompass all occasions in which a planned sequence of mental or physical activity fails to achieve its intended outcome, and when these failures cannot be attributed to the intervention of some chance failure (Reason, 1990, p. 9). Reason has then synthesized the available knowledge of individual factors with system factors, examining their relationship, this position underline the complexity of error and the difficulties in identifying causation. This perspective is sometimes called "human factors" (Reason, 1990) or Human error theory (Parker and Lawton, 2002).

According to Armitage (2009), the most essential philosophical point about understanding error is accepting its inevitability; human error can be seen in two ways: a person approach or a systems approach. Theories of human error developed from research findings in cognitive and social psychology laboratories and from observational studies of error in everyday life. It is suggested that there are several broad types of error, or aberrant behaviour. Much of the time our performance on everyday tasks is automatic, rapid, and occurs without conscious attention (HE theory) (Reusman, 1988).

A cognitive psychologist studying the mental processes that leads to error, would suggest that error classification is basically based on intention (Reusman, 1988). Armitage (2009) reported that human performance was stratified by Rasmussen and Jensen (1974) into three levels: skill-based, rule-based and knowledge based. Norman (1988) analysed concepts like human tasks, heuristics as cognitive shortcuts, and error types, he ultimately segregated slips, lapses and mistakes all as active failures with the first two which are skill-based errors with the third which is error of planning. According to Reason (2009), a slip refers to “a potentially observable error which results from failure in the execution and/or storage stage of an action, regardless of the original plan’s adequacy”. According to Armitage (2009), it is argued that the most essential philosophical point about understanding error is accepting its inevitability in nursing culture and recognising that the contribution from those involved at the sharp end in a given error are likely to be just one component of causation.

Leape (1994) defines five specific mechanisms that should be used to treat and design out human error within systems: not to depend completely on an individual’s memory, improved information access, error proofing, standardisation and training. These mechanisms all respond to some of the intrinsic cognitive shortfalls like carelessness or negligence that can result in active failures (Leape, 1994).

Human errors do not fall into a single category because errors happen in different stages and take a different form, and a different part of the organization which needs different management solutions. The actions of pilots or physicians are governed by managerial and regulatory control. These administrative controls form a major part of any hazard system defenses and represent two main kinds, External controls such as rules, regulations and procedures. Internal controls such knowledge, skills and experience. Figure 3.3 shows the error types.

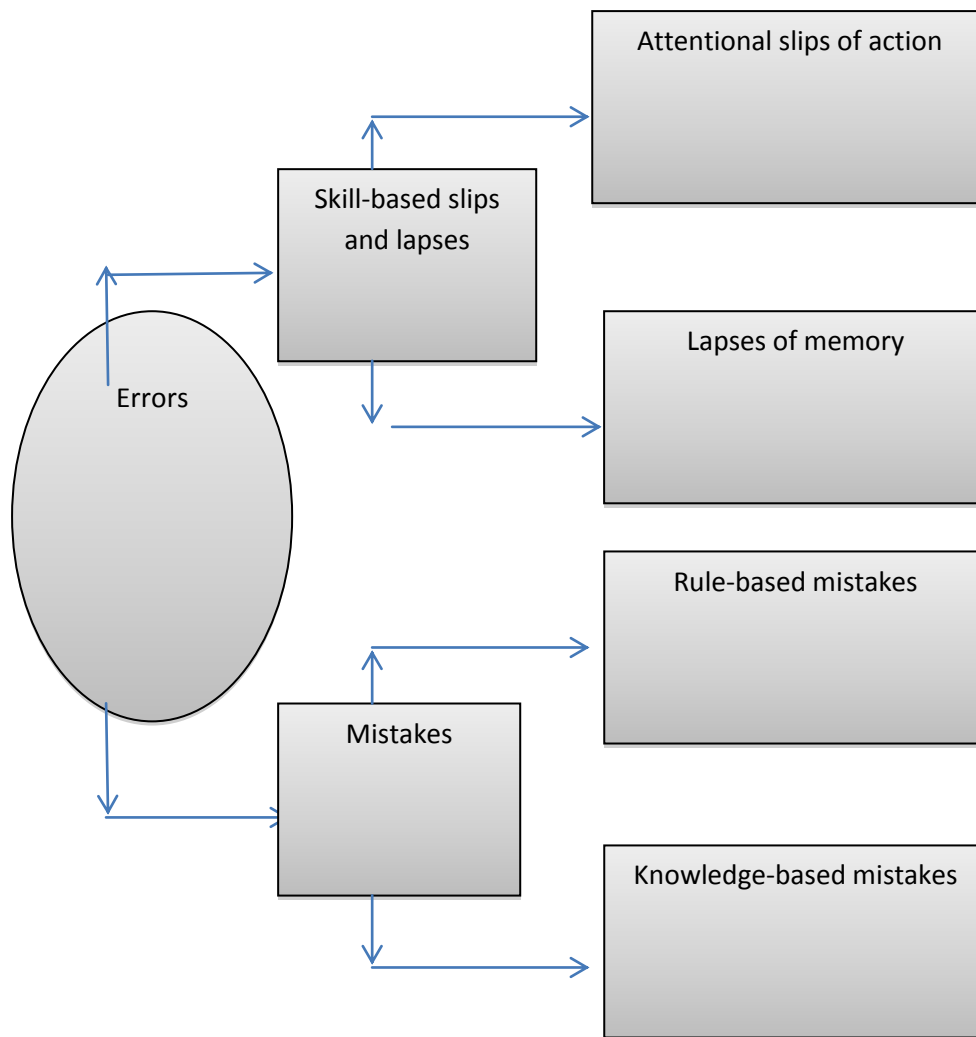


Figure (3.3) Summary of the principal errors types (Reason, 1997).

### **Systems approach (Reason, 1990)**

The system approach concentrates on the conditions under which individuals work and try to build defences. The basic premise being that humans are fallible even in the best organisations. Errors are seen as consequences rather than causes. The assumption of this approach is that we cannot change the human condition but we can change the conditions under which humans work. All hazards and technologies have barriers or defences to prevent error, it is important not concentrate on who made the error but how and why the defence failed (Reason, 1990).

### Person approach (Reason, 1990)

The tradition of the person approach is a focus on the unsafe acts such as slips, lapses, errors and procedural violations of people at the sharp end such as nurses, physicians. It views these unsafe acts as arising primarily from aberrant mental processes such as forgetfulness, inattention, poor motivation, carelessness, negligence, and recklessness. Methods of addressing these issues include poster campaigns that appeal to people's sense of fear, writing another procedure (or adding to existing ones), disciplinary measures, threat of litigation, retraining, naming, blaming, and shaming. Followers of this approach may tend to treat errors as moral issues, assuming that bad things happen to bad people.

### Swiss cheese model (Reason, 1990)

The focus of the Swiss cheese model is incident/accident causation. It is designed to have layers or slices to represent the defense of error. Reason's (1990) "Swiss Cheese" Model is now a familiar concept in numerous industries; such as the airline and aviation industry. (Hayward et al., 2008). In the airline industry efforts are in place to improve pilots' focus when preparing to fly a plane. This model uses slices to show stages of a work-process. As the processes unfold, holes in defenses may line up, which allows an error to be propagated across the stages. Figure 3.1 summarises Reason's accident causation model

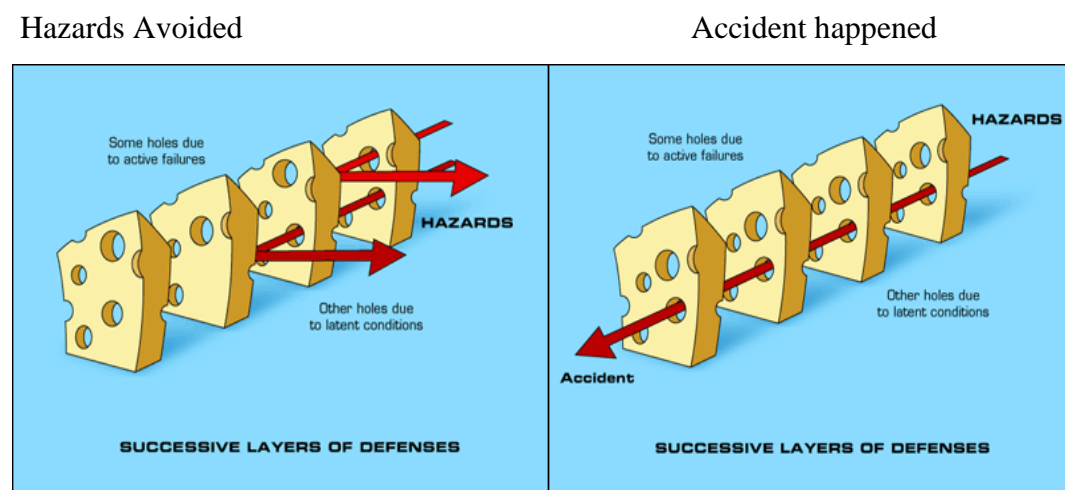


Figure 3.1: Theoretical framework for Reason's accident causation model (Reason, 1990)

This model can apply to medication errors, e.g. prescribing by doctors, dispensing by pharmacist, or administration by nurses, at each stage there is either potential to make or prevent an error. Defences, barriers, and safeguards occupy a key position in the system

approach. High technology systems have many defensive layers: some are engineered (alarms, physical barriers, automatic shutdowns, etc.), others rely on people (surgeons, anaesthetists, pilots, control room operators, etc.), and yet others depend on procedures and administrative controls. Their function is to protect potential victims and assets from local hazards. Mostly they do this very effectively, but there are always weaknesses.

In an ideal world each defensive layer would be intact. In reality, however, they are more like slices of Swiss cheese, having many holes, though unlike in the cheese, these holes are continually opening, shutting, and shifting their location. The presence of holes in any one “slice” does not normally cause a bad outcome. Usually, this can happen only when the holes in many layers momentarily line up to permit a trajectory of accident opportunity, bringing hazards into damaging contact with victims (figure3.1). The holes in the defences arise for two reasons, active failures and latent conditions. Nearly all adverse events involve a combination of these two sets of factors.

The clarity of Reason’s Swiss cheese model was probed in a research study by Perneger and colleagues (2005). A number of health professionals were asked about the relevance of the model to healthcare practice. They stated it is inconsistent, a dominant theme being an overemphasis on latent conditions or systems factors compared to the active failures. Perneger concluded that Reason’s Organisational Accident Model (Reason, 1997), which explicitly shows the differing concepts of latent conditions, local conditions, and active failures, is more appropriate for describing system failures (see Figure 3.2).

Another criticism has been that the model is insufficiently specific regarding the nature of the holes in the cheese and their inter-relationships. Thus, it is not easily applicable as an investigation tool (Luxhoj & Kauffeld, 2003).

### **Organisational Accident Model (Reason, 1997)**

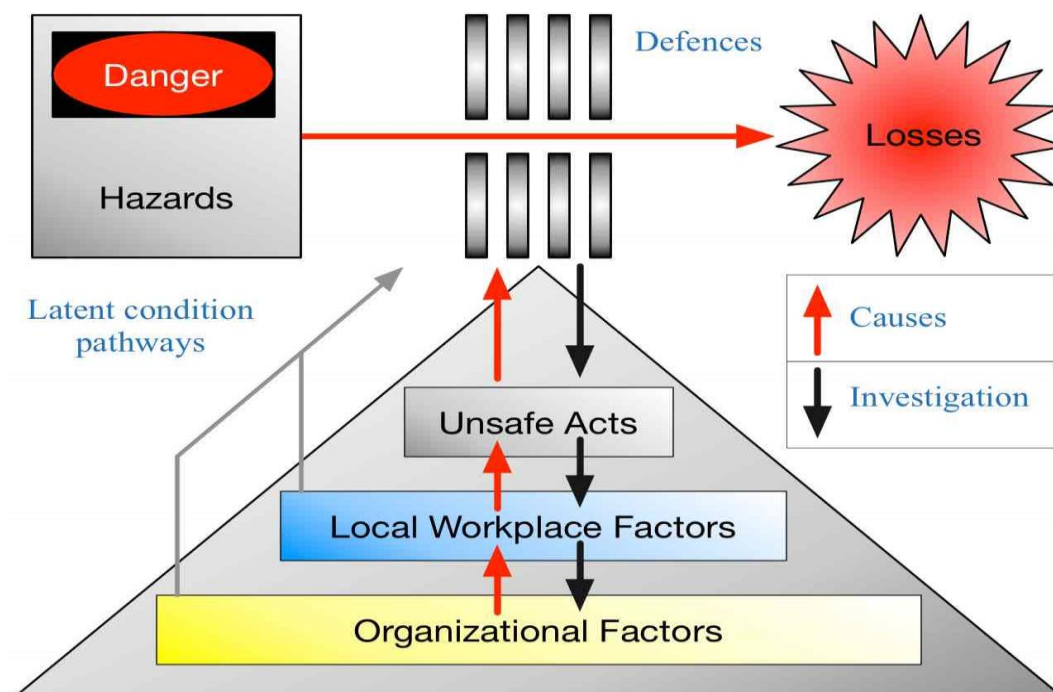
James Reason’s ‘Organisational Accident’ Model (1997) is one of the most influential and frequently used and cited frameworks of systems failure in a variety of modern safety fields (Tolley, 2007).

It is well recognised within healthcare settings that it is necessary to take a systemic understanding of organisational conditions and accept human fallibility as part of any causal



analysis. According to Reason's (1997) approach, accidents are caused both by 'active' and 'latent' conditions. Active failures are slips, lapses, mistakes and violations committed by human operators close to the event itself. They are often the triggering event for an incident, but are often themselves the consequences of existing conditions more deeply embedded in the system. These latent conditions (originally referred to as latent failures) result from the decisions of system designers, procedure developers and managerial control over time.

The Organisational Accident Model seeks to link the various contributing factors into a coherent sequence that runs upward in causation and downward in investigation as shown in (3.2). There are three levels: the person (unsafe acts); the workplace (error-provoking condition) and the organisation. The causal story starts with the organisational factors: strategic decision, planning and budgeting. The consequences of these activities are then communicated throughout the organisation to an individual workplace such as: time pressure, understaffing and inadequate tools and equipment. Within the workplace, these local factors combine with natural human tendencies to produce errors and violation called "Unsafe acts" committed by individuals and teams at the sharp end. Large numbers of these unsafe acts will be made but only very few of them will create holes in the defences (Reason, 1997).



**Figure(3.2): Stages in the development and investigation of an organizational accident (Reason 1997, Ashgate Publishing Ltd.**

Reason also distinguishes between latent and active failures. Latent conditions are “the inevitable (resident pathogens) within the system” that arise from decisions made by managers, engineers, designers and others (Reason, 2000, p.769). Reason suggests that active failures are like mosquitoes on swamps and it may be more effective to drain these swamps than to kill mosquitoes (or active failures) one by one. The best remedies are to create more effective defences and to drain the swamps in which the mosquito or active failures breed. The swamps, in this case, are the ever present latent conditions. Building on this, and towards developing the tools for managing unsafe acts, Reason (2009) proposed that error management has two components: limiting the incidence of dangerous errors, if that does not work then creating systems that will be able to accept the occurrence of errors and encompass their damaging effects should help. High reliability organizations are not facing limited adverse events, but rather they have learnt the skill of changing this occasional error or problem into enhanced resilience of the system. In latent conditions, it takes a long time for a system error or failure to combine with active failures to create an accident opportunity. Additional latent conditions can be identified and remedied before an adverse event occurs. This indeed might assist in managing errors proactively rather than reactively. With the philosophy of latent conditions, Reason (2009) believed that managers cannot change the human condition; it is easier to change the conditions under which humans work.

### **The Yorkshire Contributory Factors Framework**

The Yorkshire contributory factors framework (Lawton et al., 2012) is an empirically based framework developed from a wide range of frameworks applied in clinical settings around the world using multiple data collection methods. The framework includes 20 contributory factor domains which were independently identified from 95 international studies (e.g., supervision and leadership). Each contributory factor was then coded by two reviewers to one of these 20 domains. The majority of studies identified active failures (errors and violations) as factors contributing to patient safety incidents. The framework has the potential to be applied across health care settings to enable practitioners in the identification and prevention of factors that may influence their practice and threats to patients’ safety. The Yorkshire framework is detailed and able to identify and classify contributing factors in an understandable way into four main categories active failures, local conditions, situational

factors and latent factors. These categories are encompassed within Reason's model which classifies error in relation to active failures, local conditions, and latent failures. The use of the two theoretical frameworks in this study enables the classification of contributing factors to medication errors in terms of active failure, situational factors, local condition and latent failure. This aids the analysis of the data and allows a clear improvement plan to be developed that can influence change and improvement.

### **The philosophical paradigms of research**

A lack of clarity of the philosophical underpinnings and assumptions in any research study makes it complicated for the reader to obtain a sense of how the knowledge is produced, or measured (Lopez & Willis, 2004). Many studies, both qualitative and quantitative, have been criticised for the absence of linkage between the methods used and a clear statement of the philosophical underpinnings (Mason, 2004). Lopez (2004) pointed out that the examination of philosophical underpinnings prior to implementing research methods can help in clarifying and justifying purposes, structures, and findings of research studies.

An essential pre-requisite to understanding philosophical perspectives of any research is the reasonable awareness of the basic philosophical terminologies. The most common three concepts that are routinely used when discussing philosophical assumptions in social science are ontology, epistemology, and methodology. Ontology refers to the nature and form of reality, or the issue of existence (Guba & Lincoln, 1994). Qualitative and quantitative research exist in two different ontological paradigms. The positivist paradigm views reality as one truth, which is there to be discovered using objective methodologies such as experimental tests and surveys. The constructivist paradigm views reality as consisting of multiple truths. The aim is to uncover these diverse perceptions through exploratory methods such as interviews and observation (Charmaz, 2006).

Epistemology refers to how knowledge of 'reality' can be accessed (Benton & Craib, 2001). In quantitative research, the experimental approach involves manipulation and control of study variables and randomization of the study population (Robson, 1993). Non-experimental research is typically designed to build up an image of an observable phenomenon or to explore events, persons, and situations that normally exist (Lobiondo-Wood & Haber, 2006). Research methodology refers to how researchers are going to measure the acknowledged

reality and develop their own theory under investigation, setting up their appropriate research plan (Blaikie, 1993). In quantitative research there are two major approaches such as experimental and non-experimental. The experimental approach involves manipulation and control of study variables and randomisation of the study population and non-experimental research designed to build up an image of an observable phenomenon or to explore events, persons, and situations that normally exist such as questionnaire (Lobiondo-Wood & Haber, 2006).

In qualitative research there are a number of different approaches to data collection and analysis reflecting this. For example, grounded theorists believe that phenomena can be understood by creating theory from qualitative data in the process of moving back and forth between sampling, data collection and analysis (Robson, 1993). They would usually use semi-structured interviews to collect data, in which the questions are developed and refined in relation to the ongoing data analysis (Robson, 1993). Ethnography researchers believe that knowledge is created through understanding cultural processes within a specific setting or group (Creswell, 2003). They would usually apply observational methods to enable an in-depth understanding of cultural practices to emerge (Creswell, 2003).

### **Quantitative research**

From a philosophical point of view, quantitative research is described by the terms of empiricism and positivism (Duffy, 1985). It has been used in physical sciences and derived from the scientific process. This research approach is a formal, systematic, objective process in which phenomena are measured using figures and numerical data to produce findings. It uses the deductive process of accumulating knowledge (Duffy, 1985) to describe, test, and examine cause and effect relationships (Burns & Grove, 1987).

Quantitative research includes two major approaches; experimental and non-experimental. The experimental approach involves manipulation and control of study variables and randomization of the study population. This design aims to establish a cause and effect relationship between dependent and independent variables (Cormack, 2000). The main feature of true experiments and quasi experiments is to provide objective and measurable evidence to explain the characteristics and mechanisms of relationships between the variables under investigation. These types of studies also allow, through regression analysis, prediction of potential relationships and subsequently enable the management of future results. This can be achieved through manipulating the independent factor to measure its effect on the

dependent factor (Carr, 1994). On the other hand, non-experimental research of the quantitative design is typically designed to build up an image of an observable phenomenon or to explore events, persons, and situations that normally exist (Lobiondo-Wood & Haber, 2006).

The quantitative researcher aims to preserve an independent, objective view to understand the facts (Duffy, 1985). Using some methods may require no direct contact with participants at all, as in self-administered or postal questionnaire surveys. The avoidance of direct investigator involvement in collecting data is thought to reduce the chance of bias which assures objectivity (Carr, 1994). Quantitative methodology has been stated to use more objective measures than qualitative (Carr, 1994). This comes from the ability of the quantitative methodology to control or eliminate extraneous variables, and the data generated by this approach can be assessed using parametric and standard tests (Duffy, 1985).

### **Application of quantitative methods in this study**

The current study is exploring Saudi nurses' perceptions about their professional role and their responsibility to report and manage medication errors in their clinical settings. A non-experimental descriptive cross-sectional quantitative design was used for the first part of this study. Although the high level of control over variables within a strict structure are strengths of quantitative research, this type of research lacks the ability to consider the research situation as real (Carr, 1994). Quantitative methods such as questionnaires may limit participants' thinking, open the door for misunderstandings and lead to difficulties in completing the questionnaire (Parahoo, 1997). Self-reporting questionnaires also hold the possibility of bias due to misunderstanding or even somebody else completing the questionnaire rather than the participant (Bergmann et al., 2004). Furthermore, sometimes data collected by questionnaires can be seen as superficial and based on a low response rate (Parahoo, 1997). However, this kind of quantitative approach can be administered and evaluated quickly. There is no need to spend time with the organisation prior to administering the survey, and the responses can be tabulated within a short timeframe. Second, numerical data obtained through this approach can facilitate comparisons between organizations or groups (Creswell, 2003).

As well as exploring Saudi nurses' perceptions on their professional role and their responsibility to report and manage medication errors in their clinical settings, another objective of the study is to explore nurses' views about factors influencing the way they

administer medication and manage medication errors in health care settings. This may help highlight their specific educational and possibly managerial needs toward developing more focused strategies to manage medication administration errors in nursing practice in Saudi Arabia. This indeed requires more flexibility in gathering nurses' views in addition to the quantitative approach. A huge amount of data can be offered about the nurses' perceptions and views of medication administrations errors.

By using a quantitative approach, however, issues related to meanings, beliefs, and values are difficult to capture and this necessitates the use of a qualitative approach in parallel to provide more thorough evidence (Parahoo, 1997).

### **Qualitative research**

Qualitative research is a philosophical approach that can generate more flexible science than quantitative research (Burns and Grove, 1987). The qualitative approach is derived from two ontological concepts - interpretivism and constructivism (Guba & Lincoln, 1994). At an ontological level, it is thought that reality or truth is socially constructed by individuals which makes it continuously changing (Guba & Lincoln, 2005). Epistemologically the mind is attempting to discover and approach what is reality, how it can be accessed and measured and whether the researcher would be part of the reality (Guba & Lincoln, 2005). Qualitative methods are inductive in nature adding a more in-depth exploration of nurses' views on medication errors to the quantitative part.

Qualitative methods have been used in wide range of research over a long time in the social sciences and increasingly in different health disciplines (Mays & Pope, 1995). They are valuable for research about experiences, thoughts, perceptions, and attitudes. Qualitative research can therefore be utilized for conceptual improvement which helps in exploring social or other subjective phenomena in natural settings, giving more awareness to the meanings, experiences, and views of all research participants (Avis, 2003; Mays & Pope, 1996). Additionally, this type of research is primarily concerned with the development of theories through the interpretation of data. Data may be generated through narrative and the interpretation can be governed by different philosophical perspectives. Philosophies of empowerment (Bridges, 2008), involvement (Florin, 2004), and feminism (Millar, 1992; Landman, 2006), have all influenced the development of qualitative methodologies in order to examine the human experience. In the field of nursing practice qualitative approaches are

becoming more common in health services research, providing unique and critical contributions to research outcomes (Shortell, 1999; Curry et al., 2014).

Some research questions are complex, personal and threatening such as questions about medication errors and punishment. For instance, qualitative research may deal with questions such as ‘what is x?’, and ‘how does x happen in what circumstances?’ Such questions can be addressed in a direct communication, where questions can be modified and the reactions, either positive or negative, can be met. Thus, the technique followed in qualitative data collection is vital to provide contextual information to interpret the meaning of the individual experience (Avis, 2003).

There are several different approaches to defining qualitative research (Silverman, 2005). In addition, more complicated definitions are rooted within specific sociological aspects that afford a particular framework for enquiry and explanation from which the social research is founded (Feldman, 1995). In qualitative research, the researcher is actively immersed in and connected to the phenomenon under investigation; therefore the study outcomes are equally produced within the context of the study which designs and clarifies the question (Denzin & Lincoln, 1994). For example, ethnographical approaches have their roots in anthropology and require the researcher to become immersed in the group being studied. The aim of this approach is to become an insider so that accurate observations can occur, (Bogdan, 1992; Fudge, 2008). The researcher and the phenomenon under investigation are connected together actively; therefore the outcomes of the study are mutually produced within the context of the interaction (Denzin & Lincoln, 1994; Guba & Lincoln, 2005). This is in line with the constructivist view that reality is created during the research process and therefore the investigation exists before the ‘reality’ is created (Smith, 1983).

Qualitative methods such as interviews may make it difficult to generalise the findings; interpretation of qualitative data is subjective as it may be biased towards the researcher’s opinion, it can be hard to compare the findings between studies because of the individual differences, and the time required for data collection, furthermore analysis and interpretation is lengthy.

### **Application of qualitative methods in this study**

Qualitative research is concerned with understanding and interpreting individuals’ views and perceptions within the phenomenon under investigation within their social world (Avis,

2000). This can be useful in a health care setting as it enables an exploration of the social processes of health and health care rather than focusing solely on quantitative health outcomes (Avis, 2000). Qualitative research involves collecting nurses' views provided in their own words and analysing these views as textual data rather than numbers (Avis, 2003). Textual data (nurses' words, texts, and possibly field notes) are perceived as the true language by which persons can express their beliefs and thoughts, and also facilitates understanding of their meaning (Avis, 2003). This can be achieved by special techniques such as in-depth interviews and participant observation (Cormack, 2000), which usually starts with the broad research question and gives the opportunity for nurses to talk and express their feelings (Avis, 2003). In-depth interviews in the current study were selected to give nurses an opportunity to provide their values, beliefs and perceptions about their experience in managing and reporting medication errors. This was expected to provide a complete picture on the topic so that the data from these interviews will explain and complement data from the quantitative part of the study.

### **The value of combining methods**

The importance and application of mixed methods has been increasing over decades (Murphy & Dingwall, 2003; Kinn & Curzio, 2005). Mixed method research inter-relates and incorporates quantitative and qualitative approaches in a single study. It is considered to be the third main research paradigm, adding an attractive alternative, when appropriate, to the other two paradigms (positivism and constructivism) (Creswell, 2002). The strengths of this design lie in the investigator combining the two methods, in this study quantitative followed by qualitative, obtaining two kinds of data. In addition, this kind of design enables the researcher to present data from two studies, using one to interpret the other and providing an understandable explanation for the reader (Creswell, 2007). The value of integrating methods lies in using obvious and more focused research aims to adequately provide explanation of how the combination may strengthen the generalization of research and reduce its uncertainty and limitations in the presentation of research findings (Duffy, 1987; Robson, 2009; Murphy & Dingwall, 2003). Mixed research methods in this study are used for complementary purposes, explaining differences and similarities, confirming and triangulating the data towards developing theories to understand and achieve the study aims (Sandelowski, 2000; Creswell et al., 2003).



Triangulation refers to the use of more than one approach to the investigation of a research question in order to enhance confidence in the ensuing findings. Since much social research is founded on the use of a single research method and as such may suffer from limitations associated with that method or from the specific application of it, triangulation offers the prospect of enhanced confidence. Triangulation is one of the several rationales for multi-method research. Triangulating data from qualitative and quantitative sources helps to overcome bias, increase depth of understanding and confirm the completeness of evidence which in turn increases the validity of findings (Murphy & Dingwall, 2003; Kinn & Curzio, 2005). Denzin (1970) extended the idea of triangulation beyond its conventional association with research methods. For example, using multiple researchers in a study (investigator triangulation) and using more than one theoretical design (theoretical triangulation), (methodological triangulation) (Denzin & Lincoln, 1994).

It is crucial to rationalise and explain each method to ensure its completeness prior to combining methods (Morse, 1991; Miles & Huberman, 1994; Morse & Chung, 2003). A comprehensive research strategy is important to manage collected data effectively facilitating consideration of the process of data analysis. For example, it may be difficult for the researcher to decide to recruit participants from the same population for both stages, or to use individuals from the same population for both studies (Creswell, 2007). Mixed method research designs have been classified according to time order (concurrent, or sequential) as well as the paradigm emphasis (equal status, or dominant status) (Creswell, 2007; Sandelowski, 2000).

There are a number of limitation and weaknesses when conducting a mixed method approach. It can be difficult for a single researcher to carry out both qualitative and quantitative research, especially if two or more approaches are expected to be done concurrently (i.e., it might require a research team). The researcher has to learn about multiple methods and approaches and understand how to appropriately mix them. It is more expensive and it is more time consuming.

Some of the details of mixed research remain to be fully worked out by research methodologists (e.g., problems of paradigm-mixing, how to qualitatively analyse quantitative data, how to interpret conflicting results) (Creswell, 2002)

**Table 3.1: Mixed methods designs**

<b>Time order</b>	
<b>Concurrent</b>	<b>Sequential</b>
<b>QUAL+QUAN (Equal status)</b>	<b>QUAL→QUAN</b> <b>QUAN→QUAL</b>
<b>QUAL+ quan (Dominant status)</b> <b>QUAN+qual</b>	<b>QUAL→quan</b> <b>qual→QUAN</b> <b>QUAN→qual</b> <b>quan→QUAL</b>

Table 3.1 shows the nine different options for a mixed methods study design, which can vary according to which method takes precedence and the order in which the studies are conducted. In order to understand such design, the researcher needs to first understand the purpose of the overall study design and the notation that is used (Sandelowski, 2000; Morgan, 1998; Creswell, 2003). The capital letters denote priority or increased weighting and lowercase letters denote lower priority or weighting. The plus sign (+) indicates the concurrent collection of data and the arrow sign (→) represents a sequential collection of data. For example: QUAN→qual is a dominant status, sequential design where the overall study is primarily quantitative but it is followed by a qualitative phase. This design was selected for the current study as qualitative data was going to be collected in the second phase to explain data from the first phase (quantitative).

### **Application of mixed methods in this study**

Data triangulation will be used in which data gathered through the quantitative questionnaires will be explained by data gathered through individual qualitative interviews. This will increase the validity and reliability of the collected data which then helps strengthen the research evidence (Robson, 2009; Miles & Huberman, 1994). Thus, a mixed method approach to data collection will provide context and explanation which a single study might

not provide. For example, a questionnaire can provide descriptive data which is unverified but may allow some correlations between variables to be made. If further data sources are added, such as interviews with participants, further explanation of the correlations may be generated. Mixed methods enables the researcher to identify the best potential data sources available without being constrained by one single method (Giddings, 2006). The fundamental component of this approach is an attempt to combine the complementary strength and minimise the weakness of different methods through a division of work (Morgan, 1998).

## **Study design**

The methodological design adopted for this study is mixed methods with quantitative and qualitative components applied sequentially (QUAN→qual) and respectively in two phases; phase one was the quantitative phase and phase two was the qualitative. For this study an explanatory sequential design has been chosen, whereas the study started with both a principal non-experimental descriptive cross-sectional quantitative design and a complementary qualitative study (QUAN+qual).

## **Design rationale**

The context of this study can be observed as complex at several levels. The multi-national nature of the workforce; the predominantly non-native English speaker communications at ward level; the Islamic culture of the country; professional perspectives drawn from different professional training backgrounds and levels of qualifications. Some of these factors may be found in other countries. However, the reviewed studies have not addressed issues of language differences between staff or whether perceptions differ between nurses trained in countries outside the country of current practice. Also different religious faiths and cultural value systems are evident in Saudi Arabia amongst nurses. These entire factors might be highly influential on nurses' medication administration and reporting medication errors.

The range of variables such as nurses' perspective on their training and preparation for practice as well as cultural factors that may enhance or impede reporting errors, suggests that a single method of data collection may not be sufficient to the task and provide only limited description without further in-depth explanation of these variables. This was the case in most of the studies examined in the systematic review described above, and therefore exposes a weakness in the literature. Only two studies in the review combined qualitative with quantitative research methods. As the mixed methods approach to data collection can provide

context and explanation which a single method might not provide and nurses' perceptions in the literature seem not fully explored in-depth, further mixed-methods research is needed to present the whole picture about nurses' perceptions of medication administration errors.

### **Study setting**

The study was undertaken in three hospitals in region of Ha'il in the north of Kingdom of Saudi Arabia. These hospitals are part of four main centres providing health care to about 597,144 people in the region (Sababhi, 2012). These hospitals are:

***King Khalid hospital*** a governmental hospital with the capacity of 220 beds and 367 nurses working in the different departments in this hospital (31 males and 336 females).

***Hail general hospital*** is a public governmental hospital managed by the Ministry of Health in KSA with a capacity of 200 beds offering both general and specialised health care. There are 234 nurses working in this hospital (25 males and 209 females).

***Maternity hospital*** provides care for patients with different obstetric and gynaecological cases with 120 beds and 215 female nurses and midwives working in it.

## **Methodology**

### **Phase 1: Quantitative study**

#### **Pre-study phase: Questionnaire development**

There was no available validated tool to measure nurses' perceptions on medication errors, in line with the study aims, objectives and theoretical framework, therefore, a questionnaire was developed and validated prior to the quantitative phase (phase1). A structured, bilingual questionnaire (Arabic and English) (Appendix 2) was developed, focusing on eliciting nurses' perceptions on the experience of medication errors (personally and by observation of others) and factors affecting reporting of errors. The components of the questionnaire were developed to answer the study aims, the content of which was based on the current evidence base discussed in chapter 2 (literature review). Additional questions reflecting the Saudi Arabian context were also used.

The questionnaire encompassed three sections with a total of 24 items (with 20 sub-items) giving a total of 61 questions with an estimated completion time of 30 minutes and asking about three main types of data; demographic data, information about nurse experience of administering medications, and information about nurse views about factors affecting reporting of errors.

Section one captured the demographic details of the nurse participant, including: gender, age, years of qualification, country of qualification, field of first qualification, highest level of academic award, nationality, language, and years of experience (questions 1-9). The items in section two (questions 10-12) focused on nurses' experience of and independence in medication administration. Section 3 included 54 questions asking about 5 topics; questions (13-16) asked about the most and the least important medication rights to nurses, question 17 included 18 statements about contributing factors to medication errors, questions 19-28 asked about events witnessed by nurses and their responses to these events, question 29 included 8 statements asked about strategies taken by the institution to minimise medication errors, and questions 30 and 31 asked about errors experienced by nurses and reasons why they were hesitant to report them., Nurses were also offered the opportunity to write their opinions in *free text* to obtain a wider view about nurses' opinions.

Due to language diversity in Saudi Arabia, the questionnaire was translated into Arabic and nurses were offered a choice between English and Arabic. The reliability of the adaptation was assured through a pilot testing stage of the study, in particular establishing the equivalence in conceptual meaning of questionnaire items, phrases and words (discussed in details in the translation section).

### **Testing the validity and reliability of the instrument**

The term 'validity' refers to the degree to which the instrument actually reflects the construct being investigated. Testing the validity of an instrument justifies its use within a particular population (Burns & Grove, 1997). The main types of validity are content, predictive, and construct validity (Burns & Grove, 1997; Polit & Hungler, 1999).

Most surveys often have what is called face validity, which is a matter of appearances. The questions seem like a reasonable way to obtain the information we are looking for, but unless tested, it is difficult to ascertain this. There are other types of validity such as content validity which is related to our ability to create questions that reflect the issue being researched and ensuring that key related subjects are not excluded. Internal validity covers whether the questions posed explain the outcome researched. Finally, external validity refers to the extent in which the results can be generalized to the target population the survey sample is representing. The way questions are posed determines the answer, so the questions should reflect how the target population talks and thinks about the issue under research, which often calls for the need to conduct exploratory qualitative research.

Content validity usually refers to the adequacy of items for the perception or variables being measured such as measures relating to feeling or psychological status (Polit & Hungler, 1999). Predictive validity describes the ability of a measure to differentiate between individual's behaviour or performance and a standard or a specified outcome (Polit and Hungler, 1999). The construct validity was concerned with the instrument's features and whole outcome more than the scores produced, i.e. "what is this measuring device really measuring? Or "has this instrument sufficiently measured the phenomenon under investigation?" (Polit and Hungler, 1999). Therefore, it was decided that testing the content validity was the most appropriate test to use to meet the aim of determining whether the language, content, and structure of the instrument were appropriate. The approach to establishing the Content Validity Index (CVI) was identified in Polit and Beck (2006). The CVI consists of two domains. The representativeness domain (R-CVI) which identifies to which extent the item is representative of a scale within an instrument, and the clarity domain (C-CVI) which identifies the clarity of the item to the reader.

Both the R-CVI and the C-CVI are applied to each item and then to the scale as a whole in the form of the Item CVI (I-CVI) and the Scale CVI (S-CVI). The I-CVI is the proportion of experts who rate an item as relevant, while the S-CVI is the proportion of items rated as relevant by all raters (Polit & Beck, 2006). An I-CVI agreement proportion of 0.78 or above indicates acceptable content validity (Polit et al., 2007). The overall S-CVI score is calculated by taking the average of the items scores (Lynn, 1986).

The content validity of the questionnaires was established by an expert panel of specialised nurses and clinicians who had extensive experience and knowledge in nursing practice in KSA. Experts were asked to either support or reject the adequacy of items which will be used to measure the hypothesised aspects of reporting medication errors and medication administration. Their duties were firstly, to evaluate the hypothesized structures of the questionnaires and compare it with the theoretical concepts. Secondly, to check the adequacy of the items used to evaluate the hypothesized aspects of medication administration. Finally, the expert panel evaluated the construction of the survey questionnaire such as layout, clarity of the language and instructions, and order of the items and responses.

The expert panel was recruited from Ha'il Region Hospitals, and consisted of nurses selected from those who have an advanced experience in nursing practice as well as research practice. Following a review of the items, panel reviewers were instructed to record their responses in the content validity questionnaire. The protocol involved the following steps: panel members were asked to rank each item for its clarity and representativeness on a four point ordinal scale: (1) item is not representative / clear; (2) item needs major revision to be representative / clear; (3) item needs minor revision to be representative / clear; and (4) item is representative / clear. Additional space on the form was available for comments and suggestions.

After ranking by panel members, the researcher derived summary dichotomous variables by collapsing categories one and two (1) and categories three and four (2). A score of one indicated an unsatisfactory outcome while a score of two indicated a satisfactory outcome. Those items that required minor revision were amended according to the suggestions made by panel members in discussion with the researcher. Internal consistency reliability was tested using Cronbach alpha on questionnaire items which showed high internal consistency value (0.844).

### **Establishing conceptual and cultural equivalence of the research instrument**

As mentioned earlier in this chapter, the target population is multi-national with several languages in use. However, the main languages of communication are English and Arabic. Therefore, translating the questionnaire was considered crucial to assure valid responses and avoid any misunderstandings and this was expected to encourage participation by all nationalities. The questionnaire is a trans-lingual application to achieve conceptual and

cultural equivalence rather than linguistic equivalence. A model of translation and adaptation of instruments developed by the World Health Organisation (WHO) was adopted to translate the questionnaire into Arabic language (WHO, 2007) (Appendix3).

Chang and colleagues (1999) proposed a set of steps to ensure conceptual equivalence of the translated instrument, which were employed here. These steps are: (a) the English version of questionnaires was translated by bilingual experts in the nursing field from English into Arabic (Forward translation), then (b) the Arabic version was translated back into English by independent professional expert translators from Saudi Arabia (Back-translation), (c) three independent bilingual professionals in Saudi checked and compared the translated questionnaires with the original copies and made the necessary modifications, and (d) pre-testing the back-translated version to assure its validity (pilot study).

The questionnaire underwent a rigorous translation process which was conducted by bilingual and bicultural experts in order to prepare valid and reliable tools for this study, including forward translation, backward translation and decentering described as follows.

- Forward translation of the survey items from English to Arabic was undertaken by professional independent bilingual translators in KSA and resulted in the first version of the questionnaire. In order to produce a clearer and more understandable version, it was essential to provide all translators with instructions on the concepts of the study to assure conceptual equivalence of the forward translation and avoid any ambiguities. Translators were also asked to use natural, simple, clear and acceptable language for nurses in Saudi Arabia to avoid any misunderstanding that might result from using technical terms.
- Backward translation was achieved involving a committee consisting of professional translators who were not involved in the forward translation. This committee included the researcher and two other independent bilingual experts who were fluent in both English and Arabic languages. The translators were health professionals and were therefore familiar with nursing vocabulary. They were also experienced in translating English documentation into Arabic and vice versa.
- Decentering is an important part of translation to achieve conceptual equivalence between the original and translated versions of an instrument (Eremenco et al., 2005; Willgerodt et al., 2005). In decentering, both the original English instrument and the Arabic translation were open to continuous reconciliation and modification to get rid



of any discrepancies between the original and translated versions, ensuring the meaning is equivalent between them (Eremenco et al., 2005) without the need for direct word-to-word translation.

### **Ensuring rigour in translation**

The more rigorous and inclusive the process of translation is, the more likely the translation achieves equivalence between cultural groups (Hilton & Skrutkowski, 2002; Mill & Ogilvie, 2003). Materials used in this study such as questionnaires and the information sheet also required translation to give the facility for nurses in KSA to choose and answer the questionnaire or even talk in the interview using the language they prefer and consequently enhancing the validity of results by ensuring they fully understood the research questions.

Ensuring rigor started with the application of a well-known WHO method of translation (WHO 2007), and in selecting translators who are fluent in both English and Arabic languages and cultures to reflect meanings in the translated materials. The translators were also able to speak different dialects in both of these languages and familiar with the nursing profession in KSA. Due to the shortage of bilingual translators with the original language (English) being their first language, translators to whom Arabic language is the first language and fluent in both English and Arabic languages were considered. The experience of these translators in both the language and the culture of Saudi Arabia helped them to provide more cultural equivalent and acceptable versions for nurses alongside the equivalent meaning of the original version.

Additionally, both questionnaires and the interviews in the current study were conducted by the researcher who is from the same culture as the majority of the participants and speaks both English and Arabic languages. Providing a choice of two languages (English and Arabic) to participants who may be monolingual, for both the questionnaire and the interviews, was important to avoid missing any important data that might result from language difficulties. Indeed due to the researcher being familiar with the two languages (English and Arabic) and the profession of participants, he was able to explain any possible misunderstandings to nurses which might threaten the validity of the research. Overall, efforts to ensure accurately translated versions of the questionnaire gave the opportunity to:

- Increase the reliability and validity of the questionnaire used in the study.

- Ensure cultural adaptation of the translated versions of the tools and make them applicable to the Saudi context.
- Maximise the response rate.

Once the translated and back translated versions were complete, they were available for evaluation by the researcher in order to produce a final translation and back translation versions ready to use. The final translation of the whole questionnaire template was then proof read by an Arabic and English group of bilingual professional researchers for any potential grammatical and formatting errors in the Arabic and English version respectively.

### **Questionnaire pilot**

The pilot of the questionnaire had two aims: 1) to check the Arabic translation of the questionnaire was accurate and 2) to test the questionnaire as a research instrument. The piloting process involved an informal group of twelve nurses (four males and eight females) who were working within the study settings at the time of the study. The respondents were chosen because they had similar characteristics to study participants and some of them used to work in the sites under investigation, they also were happy to assist in the clarification of the study instrument. It was presumed that people with similar characteristics may perceive and interpret concepts similarly which would help in obtaining more valid data from the actual participants. This sample size depended on the availability and accessibility of participants. A similar number of nurses have been used in similar studies during the same stages (Eremenco et al., 2005). To check the Arabic translation of the questionnaire, the nurses were provided with the Arabic and back-translated versions and requested to read them thoroughly at least one week before they were followed up with an informal interview by the researcher. To test the questionnaire as a research instrument, each panel member was asked to rate each item using a 5-point Likert scale for appropriateness (1 = not appropriate to 5 = most appropriate). Panel members were also invited to comment on the wording of items and response format, and to suggest other items to be added to the test. Any comments from the panel about discrepancies and dissimilarities between the two translations, and comments on the questionnaire items were used for further review of the translation process and to make amendments to the content of the questionnaire, until consensus of the group established a reliable and valid translated version. All nurses in this pilot study agreed that the questionnaire was well developed, well translated and clear. Minor amendments such as minor rephrasing of items were introduced prior to the main study for clarity and to suit the

cultural norms in KSA and help nurses to answer the questions within their own cultural beliefs and attitudes.

Prior to the data collection process, the researcher discussed concepts in the questionnaire with nursing officers in the organisations under investigation to ensure conceptual equivalence and the extent to which nurses in Saudi Arabia may accept to either complete the questionnaire or attend the interview. Table 3.7 provides an overview of the origins and expertise of the translators.

**Table 3.2: Origins and expertise of the translators**

	<b>Country of Origin</b>	<b>Place / years of Experience</b>	<b>Specialty/Field</b>
Translator 1	Saudi Arabia	13 years	Nursing
Translator 2	Saudi Arabia	14 years	Nursing
Back Translator 3	Saudi Arabia	16 years	Manage/Pharm.
Back Translator 4	Saudi Arabia	19 years	Manage/Nursing

The pilot study highlighted a number of small amendments to suit the cultural norms in KSA and help nurses to answer the questions within their own cultural beliefs and attitudes. Appendix (2) shows the final version of the questionnaire which has been used for nurses in the main study after changes were introduced. The data from the pilot was informative but not included in the main study data set.

The survey lacked a systematic validation, to optimise rigour, before use the questionnaire ideally should have been more rigorously validated by testing for different types of validity such as, predictive validity, concurrent validity and convergent validity. This is more than just a pilot study & testing for content validity –validating a questionnaire should have a long process of testing the questions for interpretation bias, and testing the questionnaire with a large enough sample to be able to analyse the data and test for ‘floor and ceiling’ effects.

## **Quantitative research process**

### **Population and sampling**

“Population” is defined as the total number of participants from whom data can potentially be collected (Parahoo, 1997). The ‘study population’ is described as a target population from whom data can hopefully be collected after determining the inclusion and exclusion criteria of the population (Parahoo, 1997). There are approximately 816 nurses currently working in the three hospitals where the study was conducted. Of these, 320 are Saudi nationals with the remaining comprising predominantly Asian and Indian nationals. These 816 nurses were the total population of the current study who met the inclusion criteria described in box (1) consisting of 56 males and 760 females.

Participants in this study included all registered nurses working in all departments within the three hospitals. There were no restrictions with respect to demographic characteristics of nurses such as age, gender, religion or the school of nursing attended. The main stipulation for being included within the study was that the nurses needed to be qualified and currently working in any of the three hospitals, in addition to being available at the time of the study (Box 3.1).

**Box (3.1): Inclusion/Exclusion criteria****Inclusion criteria**

- Registered nurses (males and females)
- Qualified as nurses and practicing nursing and providing care for all types of patients in all selected locations
- Available at the time of the study

**Exclusion criteria**

- Unqualified nurses, students and nursing assistants
- Nurses on leave or on secondment to a different site (longer than 3 months) during the period of the study
- Attending external training courses off site (longer than 3 months) during the period of the study
- Nurses working in areas where they are not practicing nursing (i.e. managers or educators)

The researcher took a number of considerations into account in order to determine the minimum sufficient sample size for the current study including published evidence about sample-population ratios, previous studies and availability of subjects. When using an instrument, an ideal ratio of 10 subjects need to be recruited per item on the questionnaire to achieve a standard level of analysis (Field, 2005), this means that a sample size of 310 nurses would be sufficient for the quantitative part of this study to match the 31 items on the study instrument. Previous studies had used similar samples and two other studies recruited samples of between 150 to 285 nurses which gives further justification for the sample numbers in this study and could be considered as sufficient for a thorough statistical analysis (Stratton et al., 2004; Handler et al., 2007). Furthermore, the availability of subjects was also crucial in order to be able to access and recruit an appropriate sample, 816 nurses in the three hospitals were available and could be approached for the study. A random sample approach

was considered but in the end it was decided that it would be relatively simple to approach all 816 nurses across the three hospitals, and this would afford a larger sample size.

Approaching all nurses in the three hospitals may fit into the specification of convenience sampling which is often utilised during preliminary research efforts to get a gross estimate of the results, without incurring the cost or time required to select a random sample. Convenience sampling is a method of choosing subjects who are suitable, available or approachable. The primary advantage of such method is that it is very easy to apply, relative to other methods (Panacek, 2007). However, usually in convenience sampling (as a non-probability sampling method), it is unlikely that all groups and subjects are selected. Therefore, a small sample may not represent the target population, and any statement generalising the results beyond the actual sample tested must be stated with qualification. This was not the case in this study as all nurses in the three hospitals met the inclusion and exclusion criteria and were included. In addition, this multi-centre study included the three hospitals in the region providing a wider range of subjects to ensure further diversity of characteristics and present more representative findings (Panacek, 2007).

### **Data collection**

Data collection for phase one took place between January and April 2013. Nurses working in three hospitals in the Ha'il region of Saudi Arabia (n=816) within the target population were invited to take part in the study. Nurses to whom the questionnaire was administered were identified through the Nursing Officer's department, and the researcher was also located within one of the hospitals in Ha'il Region in Saudi Arabia during this period, in order to manage the data collection process locally. The Nursing Administration office was contacted by a letter to seek for the agreement to access nurses for the study as well as their participation in administering study documents. They were also provided with a copy of all study documents and a copy of the local ethical approval (Appendix 9).

This project geographically covered a wide area in a limited time. Therefore, it was more helpful to recruit and train people within the study sites to help in administering the questionnaire to participants. Distribution and collection was undertaken by a central administrative team in the individual hospitals and none of them were able to access to the contents of the returned packs. The nurses in the teams were either from the research

department in each selected hospital or who had participated in different previous research studies.

Nurses were provided, through the central administrative team at the regional level, with a questionnaire pack including the invitation letter (Appendix 4), participant information sheet (Appendix 10), questionnaire (Appendix 2), stamped return envelope marked 'Confidential', reply slip (Appendix 5), and consent form (Appendix 2) to be signed and returned by nurses with the completed questionnaire. All participants were assured in the letter that confidentiality and privacy of their answers would be maintained throughout the study process. In addition, anonymity was maintained, as no names or any other identification or personal information was required. Although participants were provided with a detailed information sheet, they were also provided with the researcher and the study supervisor's contact details for any further enquiries about the study.

The administration teams in the selected hospitals, agreed to distribute the questionnaires on behalf of the researcher which enabled the researcher to achieve more anonymity and maintain the confidentiality of the nurses' identities. The administration was asked to provide a list of distributed questionnaires. The list included the overall number distributed and the numbers distributed to each hospital. This enabled the researcher to follow the progress of the distributed questionnaires and made it easy to evaluate the rate of returns. As the rate of returns was initially low, reminders were sent out through the nursing officers. The researcher or his assistants collected the completed questionnaires from the wards and clinics every morning. Upon receiving the completed questionnaires, the researcher started organising questionnaires and coding them for analysis.

## **Data analysis**

Quantitative data were entered on the Statistical Package of Social Science (SPSS\*17) software for analysis. Once the data was entered into the software, data from the questionnaire was initially scanned and cleaned and filtered for any outliers or any missing data prior to analysis (Hair et al., 2006). Questions which were not answered or answered incompletely were excluded from data analysis, and the missing answers were coded as 99. The data analysis then proceeded in three stages. Firstly, demographic/contextual characteristics of the participants were presented. This was followed by analysing the responses to each item using frequency distributions (counts and percentages), summarising the responses to each item using descriptive statistics. Data in the questionnaire were at

nominal and ordinal level and this required non-parametric quantitative data analysis and specific tests according to variables to be compared, for example Mann Whitney U was used to compare data between two groups such as gender, Kruskal Wallis to compare data between three or more variables and Chi-square used for categorical variables.

## **Phase 2: Qualitative study**

### **Pre-study phase: Interview guide development**

Face to face interviews have been attempted in some of the other reviewed studies but with little reported participation. However, interviews are seen as a means of understanding and predicting human behaviour, (Kvale & Brinkman, 2009). This is important in this study because of the complex number of variables which need to be understood and of the limitations of the questionnaire in providing detailed responses. For the type of interviews, the researcher considered the interview which helps participants to explain their feelings and provides more in-depth data without being restricted in selecting their answers (structured) nor left talking freely (unstructured) and possibly giving undesired data.

Semi-structured interviews are characterised by addressing different topics within the same phenomenon through a set of questions to achieve study objectives thoroughly. Furthermore, it enables the researcher to attain equivalence of meaning rather than just wording questions (Denzin, 1979), and offers a more flexible approach in data collection (Fitzpatrick & Boulton, 1994). Semi-structured interviews are considered as the most appropriate technique to obtain nurses' views in this study because this type of interview allows the researcher to achieve the study aim and objectives, and facilitates more viewpoints about the addressed topics.

The interview schedule was guided by topics drawn from the existing literature as well as themes included in the questionnaire and the study aims (Appendix 2); nurses' perception of medication errors, nurses' reaction and role in reporting and managing an actual medication error event, and nurses' views on their education and preparation to administer medication safely. The interviews also explain in more depth nurses' experiences and views taking into consideration the limitations of the questionnaire. Findings from the questionnaire (see Chapter 4) influenced the development and updating of the interview schedule. For example questions were included that allowed probing to enable interviewees to expand their answers



regarding the contributing factors, the reporting barriers as well as the strategies to minimise these errors.

### **Pilot and practice interviews**

Interviews were initially planned to follow on from the questionnaire study, with the participants recruited in one of two ways. First, the anonymous questionnaire contained an invitation to participate (Appendix 4) in a follow up or alternative interview for those who completed the questionnaire asking for nurses' contact details through a reply slip provided with the questionnaire package (Appendix5). Second, a general invitation was posted on the bulletin board of the hospital (Appendix 6). The interviews were conducted in the meeting room of the nursing office in one of the participating hospitals. There were six participants (1 Saudi male, 5 females) from three countries; Philippines, India and Indonesia. The six interviews followed the technique and structure of the questionnaire (Appendix2) with probing and some questions added to the interview study to obtain more in-depth data and cover parts which were not covered in the quantitative study. Six interviews were conducted with participants from different nationalities (1 Saudi, 2 Indian, 2 Philippine, 1 Indonesian).

Unfortunately these interviews did not provide the increased in-depth information which was anticipated; participants were reluctant to speak and their answers were short and superficial. This may have been due to fear or language barriers or the structured nature of the interview questions. They did provide some interesting results, as reported below.

The participants showed the importance of reporting errors by saying they had reported the errors they made. Two out of six nurses made at least one medication error in the last 12 months which resulted in no harm to the patient. None of them had made at least one medication error in the last 12 months which resulted in potential harm to a patient and which needed to be resolved medically. In comparison to the percentage of nurses in the survey who had made errors, this figure is relatively high. When asked about the "5 rights", nurses in these interviews believed that the right patient was the most important right with all of them agreeing that the time is least important right. Factors which were perceived as contributing to errors were similar to those reported in the survey and included interruptions during medication rounds, lack of training, unclear verbal instructions between doctors and nurses, not following the 5 rights, high work load and poor hand writing. With regard to witnessing and reporting errors, two interviewees witnessed an actual error by another nurse which was wrong dosage. The majority of participants believed that other nurses do not

report errors because of fear of punishment and other different cultural views about what constitutes an error. Nurses agreed that those nurses who report their own errors should be supported with additional training. Finally when nurses were asked whether they would ignore errors in some circumstances, all nurses disagreed, which might indicate that nurses would report all errors if they had confidence in their leaders managing these errors appropriately. Nurses in this part of the study agreed that using the bar code and dispensing technology on medication labels can reduce medication errors. They also believed that hospital medication procedures plays a crucial role in protecting patient safety and hospital guided medications procedures can minimise stress or unnecessary pressure on nurses.

The lack of depth in these results suggested that this was an unsuitable approach to gain the in depth information required. This was therefore used as a pilot or practice interview phase which allowed the researcher to test the approach to conducting interviews and estimate the time required to conduct the interview (30-45 minutes). The interview approach was therefore revised, as described below.

### **Development of interview scenarios**

A summary of the pilot interviews and the data obtained has been included above. In order to provide more in-depth material, and to overcome any issues regarding fear, the interview schedule was revised to be less structured and use hypothetical scenarios to obtain information on how nurses would react when faced with particular medication errors rather than ask the nurses directly whether they had been involved in an error. (Appendix 8). These scenarios were developed from existing literature, the results of the questionnaire and the researcher's knowledge of current practice in relation to medication errors in Saudi Arabia, in consultation with experts in the field. Each scenario was developed to reflect one of the following rights of medication administration; right medication, right route, right patient, right time, and right dose (Jones, 2010). Prior to the interviews the new schedule was practiced with two Saudi Arabian nurses to ensure familiarity with the schedule and potential responses. This was used as a practice only, and the data was not collected or analysed.

### **Qualitative research process**

#### **Sampling and recruitment**

The invitation to participate in the face to face interviews was arranged via a general invitation which was distributed by administrators in each hospital to each hospital

department. (Appendix 6). The general invitation indicated the nature of the discussion but it explicitly indicated that no questions would relate to the individual participant's performance. This step was taken to encourage participation by removing any doubt as to the purpose and confidentiality of the interview. For those who wished to participate, the expression of interest could be left in a box in a general nursing management office in each hospital.

In phase two (interviews), a smaller number of nurses were recruited, to explore in more depth the nurses' views on medication administration and such behaviour when a medication error occurs. A total sample of 20 nurses across the three hospitals was considered appropriate for this part of the study. A similar number of participants was also used in other similar studies (Schelbred, 2007 & Sanghera, 2007) and achieved data saturation which supported, from the researcher's point of view, the rationale supporting this number (Chur-Hansen, 2002). The timeframe available for the study and the availability of subjects at the time of the study is also important to be considered when estimating the number of participants for interviews. In the quantitative study, the male/female ratio was unbalanced with 210 females participating compared to only 26 males. In an attempt to overcome this bias in the qualitative study, the researcher selected 10 females and 10 males from those who returned their reply slips (22 male/34 female). Because nurses' responses on the questionnaire items differed according to nurses' demographic characteristics, these characteristics were used to select nurses for interviews using a maximum variation approach (Al-Busaidi, 2008). These characteristics included country of origin, qualifications, years of experience and a variety of age ranges. This sampling method aims to select study units which represent a wide range of variation in dimensions of interest (Hardon, 2001). Number of years qualified was particularly important, as newly qualified nurses would have less experience of dealing with medication errors and therefore it was important to balance their views with the views of more experienced nurses.

### **Qualitative data collection**

The interviews took between 30-35 minutes and took place in the nurses' hospital in a quiet room provided by the nursing management. Nurses were offered a choice of two languages (Arabic or English) to discuss the study topic in a language that was comfortable to them and minimise problems with comprehension and expression, if using a language in which they were not fluent. The researcher presumed that nurses might be liable to punishments or even embarrassment because of medication errors; therefore, nurses were assured that any

information they provided would not be disclosed or used for administrative actions against them. They were reminded of the role of the Saudi Council for Health Specialists to protect and support health care professionals.

Prior to the start of each interview, the researcher explained what would happen during the interview and reminded participants that their participation was absolutely voluntary and they had the right to withdraw from the interview at any time and without giving any reason. At the beginning of the interview, each of the participating nurses was asked to complete and sign a consent form prior to the interview, indicating their willingness to take part in the study (Appendix13). The researcher also offered nurses the choice of not answering any personal or embarrassing questions and reminded them of the confidentiality of their interviews.

To assure their privacy, nurses were interviewed in the Nursing officer's meeting room (outside meeting's times); a quiet and highly confidential environment. For anonymity, the researcher used pseudonyms for each participant throughout writing up the findings accompanied with letters (M and F) to show their gender, for example, AZ\_M is male and IN\_F is female. In line with the nurses' cultural beliefs in Saudi Arabia (male-female communication is taboo), female interviewees were offered a female chaperone to be present or an open meeting place. It was found that despite these considerations, Saudi female nurses avoided spending a long time with the researcher and appeared to strive to finish the interview sooner. There was also one female nurse who withdrew during the information and consent process. This will be discussed further in Chapter 6.

As the researcher is bilingual (Arabic and English) and to improve data collection, nurses were offered a choice of language for the interview to be conducted in (Arabic or English). The researcher conducted two training interviews with his colleagues to familiarise himself with the interview process and make sure that translation was equivalent. These two interviews were not included in the analysis. In the end all interviews were conducted in English. Data from the nurses were transcribed by the researcher for analysis with each of the transcript being prepared, edited, and returned to the interviewed nurse for further validity. This facilitated respondent validation; the aim was to confirm that the data transcribed reflected what the nurses provided in the interview.

## **Qualitative data analysis**

Qualitative data analysis is a continuous process starting from the time of data collection and continuing through to interview recording and transcribing. Qualitative research is centred on understanding and interpreting all the participants' information through classifying themes into meaningful categories and then translating them into a meaningful framework or model. Before conducting the interviews, the researcher developed an interview guide from the literature and issues which had arisen in the questionnaires.

All interviews were audio-taped and transcribed verbatim by the researcher. Each tape was listened to at least twice, once before the audiotape transcription and then later on to check the typed text with the data transcribed. All transcripts were checked for any meaningless words or sentences. The researcher achieved this through immersion (reading and re-reading the text until near saturation point had been reached) and reading the written data in the documents in order to gain an understanding of the whole situation and then re-reading slowly to determine its significant features in order to be familiar with this data. In addition to reading, the researcher listened to recordings and re-read the interview transcripts and then filtering out, deleting or editing, any meaningless data prior to data analysis. Further, transcripts were returned to the interviewees to validate the content of these transcripts and make sure that nurses' words and meanings in the interviews were all included in the transcripts (respondent validation). Qualitative data from the interviews was then entered, coded and analysed following a well-structured thematic framework (Miles & Huberman, 1994).

The data analysis consisted of inductive and deductive elements. In line with the theoretical frameworks identified earlier in the chapter, it was important to classify nurses' responses in relation to the Yorkshire contributory factors framework developed by Lawton, et al., (2012) and Reason's organisational accident model (1997). As noted above, Reason's model enables classification of the level of error in relation to active failures, local conditions, and latent failures. The Yorkshire framework is more detailed and is able to identify and classify contributing factors in an understandable way into four main categories active failures, local conditions, situational factors and latent factors and both of them being used in this study. It was also important to generate inductive categories and themes based on nurses' perceptions of their experiences.

The framework of Miles and Huberman (1994) was applied to manage data from the interviews. This framework started with researcher's familiarisation with the data through immersing himself in the details of each transcript to gain a sense of data from all interviews prior to dividing them into sections and identifying recurring themes. Second, it continued to manually identify low level of themes (codes) which were then categorised and nested in more complicated themes. This facilitated comparison across and within cases or themes. Third, the interpretative stage started with developing the conceptual categories or higher order themes to generate the theory. Within this framework, initial single codes were drawn from the data preceding developing the main themes. The emerging themes were then arranged and indexed according to how they were embedded in the participants' views. They were also summarised and organized in the analytical framework to provide understandable and contextual information which would pull together more in-depth data on nurses' responses which would be married to information provided in the previous chapter (chapter 4), providing more comprehensive and understandable evidence. The table in chapter 5 presents the categories of data (themes and sub-themes after coding stage) that were related to participants' views and embedded within the main category "Nurses' perceptions of reporting and managing medication errors".

The difference between inductive and deductive approaches to research is that whilst a deductive approach is aimed at testing theory, an inductive approach is concerned with the generation of new theory emerging from the data. I planned to draw some themes deductively and some inductively from the interview data. It was important to explore nurses' perceptions in relation to the theoretical frameworks, the Yorkshire contributory factors framework developed by Lawton et al., (2012) and Reason's organisational accident model (1997), so the first theme 'Contributing factors of medication errors' contained the pre-defined categories. In the following four themes, the categories emerged inductively, however I do realise now that the themes were pre-determined in relation to my interview questions. In hindsight I realise that this did not constitute the best qualitative research approach. I understand that because I pre-defined the themes that I was looking for in the data, there was little opportunity for participants' views that did not fit into my pre-defined categories to emerge and therefore the level of my interpretation was limited and this limits the confirmability of the findings. If I were to conduct the qualitative phase again, I would use a more unstructured approach, asking participants generally about their experiences and perceptions of medication error. I would still use the scenarios as they were an important tool to stimulate discussion around

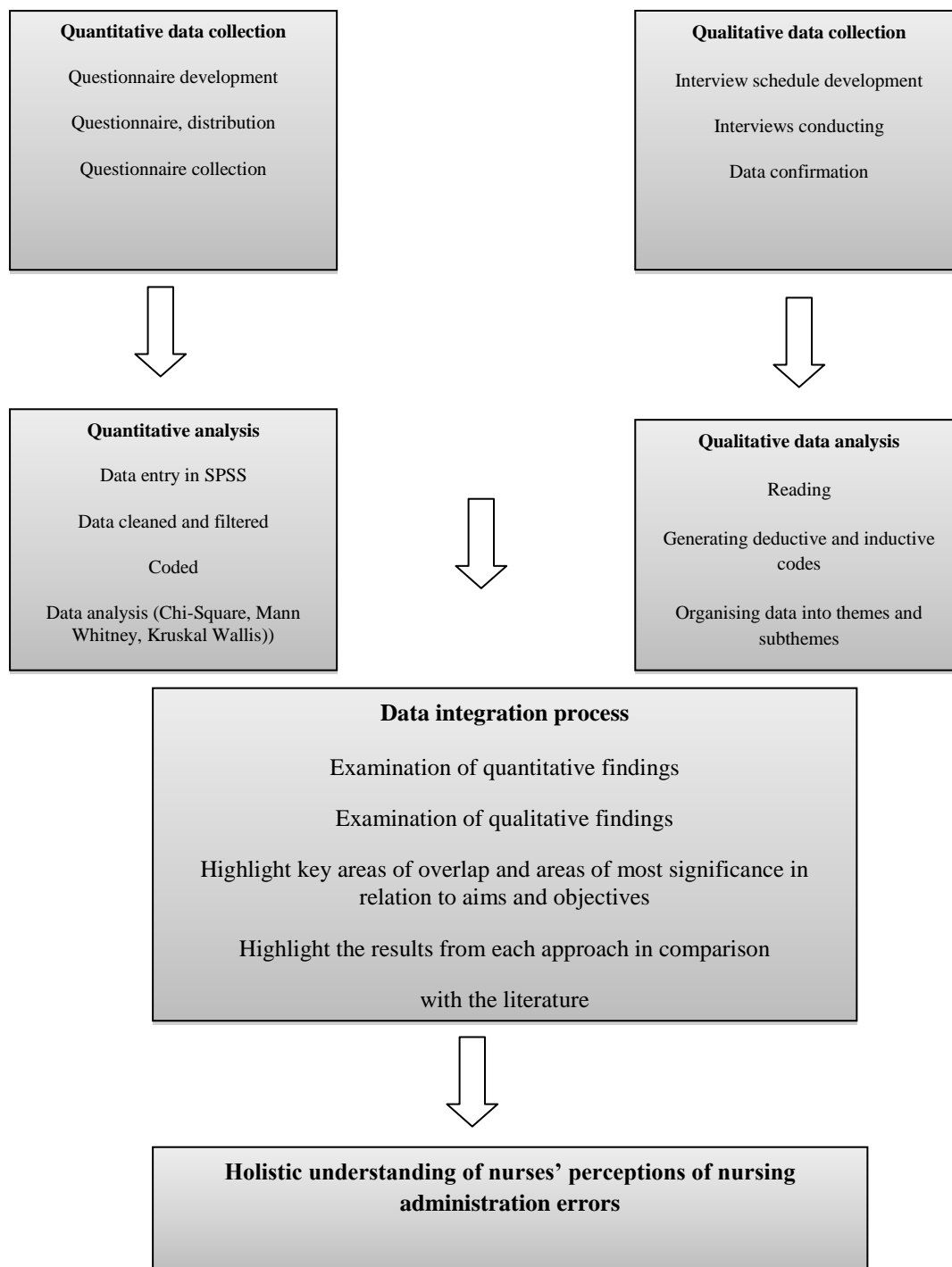
this sensitive issue. I would use a framework analysis (Richie & Spencer, 2009) approach to analyse the data thematically, which would allow me to pre-define some themes and categories in relation to the theoretical frameworks and scenarios, but also to generate new themes inductively which were unrelated to the survey questions. This would ensure that the qualitative data represented the participants' perceptions rather than my own views, and would enable the qualitative data to truly confirm, or not, the results of the survey.

In order to protect nurses' identity and organize and follow the data, the researcher used pseudonyms (non-identifiable names) for the quotes. Therefore, each quote was cited by name, and gender. Data was discussed by the researcher and the academic supervisor to make themes clear, clarify analytical frameworks and verify data patterns to minimise bias from a single researcher analysis. The thematic analysis was conducted by the researcher with the academic supervisor checking themes to verify the approach. The supervisor looked through the interview transcripts in relation to the themes to check for accuracy of the interpretation. Observations were discussed with the supervisor which enabled the themes and categories to be refined. Any new observations by the supervisor were considered in the analysis.

### **Phase 3: Data integration and presentation**

Data from quantitative and qualitative sources was integrated and combined for complementary and triangulation purposes (Sandelowski, 2000). Triangulation through mixed-methods facilitates validation of data from more than two separate sources, through cross-verification. In an applied social science research such as the topic under investigation, triangulation is often used to indicate that more than two methods are used in a study, with a view to double (or triple) checking results (Cresswell, 2003). Data triangulation was used in this study to enable the combination of data representing multiple philosophical perspectives and theoretical models, as an attempt to overcome intrinsic biases and the problems inherent in a single method. Data from the questionnaire were triangulated and compared with data from the qualitative interviews to explain nurses' perceptions about medication administration and errors in the discussion chapter later.

**Figure 3.4: Data integration process**



It is argued that each element of quantitative and qualitative data will decrease the weakness of another giving more comprehensive evidence (Kinn & Curzio, 2005). For example, the weakness of the small sample size in the qualitative part was decreased by selecting a large number in the quantitative part and the in-depth data missed in the quantitative part was assured in the qualitative part. This increases confirmation of data; enhanced



comprehensiveness and completeness of results, and in turn broader and deeper interpretation of nurses' views on medication administration errors in the selected hospitals.

The whole data set was combined to inform each of the themes; i) nurses' perceptions on their role and responsibility to report and manage medication errors, ii) nurses' views about organisational and environmental factors that may influence medication administration in health care settings, iii) nurses' education and preparation toward developing more focused strategies to manage medication administration errors. No additional information was provided by nurses via facial expressions or field notes.

### **Ethical considerations**

Ethical approval was sought from the University of Salford Research Ethics Committee (Appendix 11) and locally, meeting the requirements of the individual ethical rules and regulations within each of the selected study sites in Saudi Arabia. Hospital officers in the study sites agreed to facilitate distribution of questionnaires to their nurses (Appendix 9). This meant that the researcher would not know the identity of respondents. For interviews, the sensitive nature of medication errors could discourage volunteers from coming forward because they feared being identified. In order to avoid this and encourage participation using this recruitment approach, a poster was used to ensure the confidential nature of participation was understood. It also described the contact process so that this could be discrete, (Appendix 6). Targeted study subjects received a package as described above containing an Invitation Letter (Appendix 4), a Participant Information Sheet, (Appendix 10), the Questionnaire data collection instrument, (Appendix 2), Consent Forms (Appendix 2) The return envelope marked 'Confidential' was addressed to the researcher at the local administrative address in Saudi Arabia. Specific drop boxes were not be used because these would draw attention to participants returning questionnaires. The Participant Information Sheet provided full information on the study and showed its voluntary nature and confidentiality with the consent form to be signed by those who agreed to complete the questionnaire and/or attend the interview. An email contact for the study supervisor was also provided in case of additional information requests. This ensured that potential participants did not have to disclose their identity to the researcher. Chaperones (see cultural issues) also completed a statement of confidentiality which participants were aware of and they agreed their presence.

Previous studies have indicated fear of punishment in reporting errors (Kim et al., 2011), so it was important to take all steps to reassure study participants about the confidential nature of their responses. The two main data protection issues are (i) the third party administrator who assists in the anonymous distribution of questionnaires and (ii) presence of chaperone during interviews. Ethical issues related to data protection, confidentiality and anonymity, informed consent, non-English speaking language are summarized below.

### **Data protection, confidentiality and anonymity**

Data from questionnaires and interviews as well as patients' documents were kept in a locked password protected cabinet accessed only by the researcher. These will be stored for up to 5 years after publication; to enable verification of data if challenged and all documents will then be shredded, deleted and disposed appropriately. Nurses' identities on the interview transcripts have been replaced by corresponding codes and pseudonyms. Nursing Officers and ward managers were not aware of identities of the nurses who took part in the study, and participants were assured that any identifiable data about them would not appear on any report of study findings, complying with the Data Protection Act in Kingdom of Saudi Arabia (1992). To ensure confidentiality and anonymity, questionnaires were administered by the third-party administrator (central administrative staff) with no link to the study or healthcare team, in blank envelopes to the nurses. Nurses placed their completed questionnaires or interview reply slip in a box, collected by the third-party administrator and returned to the researcher. Chaperones present during the interviews signed confidentiality agreements.

### **Informed consent**

The International Council of Nurses (ICN, 2006) proposed that beneficence, non-maleficence, faithfulness, fairness, veracity, and confidentiality should be considered as principles of nursing research. In addition, participants have the right not to be harmed, to be fully notified about the study, to be self-determined and guaranteed privacy, anonymity, and confidentiality. Informed consent was achieved by first providing a cover letter and a detailed information sheet (Appendices 4 & 10) to each participant to make them aware of the aim of the study as well as anything they would expect if they decided to take part in the study or decided to withdraw from the study. The researcher's contact details were also provided enabling participants the opportunity to ask questions before they decided to be involved or clarify questions on the questionnaires that were unclear before they were completed. Prior to each interview, participants were offered a time to ask for further details not mentioned in the

information sheet. Therefore informed consent for questionnaire completion and interview attendance was obtained prior participation in these two phases, to indicate they were satisfied and sufficiently informed to take part.

### **Cultural and language issues**

Saudi Arabia is an Islamic country with its own rules and regulations regarding issues such as gender and communications. There are nurses from different religious faiths and cultural value systems who are also part of the nursing system in the country. Complying with cultural and social issues in Saudi Arabia regarding to same-gender preference, the participant was offered to choose the gender of the interviewer. Given that Arabic was the first and English the second language of many participants who were taking part in the study, nurses were offered a choice of language (Arabic and English) to complete the questionnaire. Interview participants were also given a choice of language either English or Arabic depending upon the preference of the study participant. However all participants opted to undertake the interviews in English.

### **Rigour**

#### **Rigour in quantitative methods**

Rigour in qualitative and quantitative research studies is achieved and assessed in different ways. In quantitative research, which from a positivist perspective aims to uncover 'one truth,' the aim is to minimise bias. The term 'validity' refers to the degree to which the instrument actually reflects the construct being investigated. Testing the validity of an instrument justifies its use within a particular population (Burns & Grove, 1997). As explained above the rigour in quantitative method testing the content validity was the most appropriate test to use to meet the aim of determining whether the language, content, and structure of the instrument were appropriate. The approach to establishing the Content Validity Index (CVI) was identified in Polit and Beck (2006). The CVI consists of two domains. The representativeness domain (R-CVI) which identifies to which extent the item is representative of a scale within an instrument, and the clarity domain (C-CVI) which identifies the clarity of the item to the reader. Internal consistency reliability was tested using Cronbach alpha on questionnaire items.

## **Rigour in qualitative methods**

The validity of qualitative research cannot be judged by truth or value, as in the positivist paradigm (Sandelowski, 1993), as researchers are constructing the meaning of experiences rather than aiming to uncover one truth. Rather, quality is judged by the extent to which the researcher has made the practices of 'trustworthiness' visible (Sandelowski, 1986). Lincoln and Guba (1985) describe four criteria for judging the trustworthiness of qualitative research: credibility, transferability, dependability, and confirmability.

### **Credibility**

Credibility of data is defined by (Morse & Chung, 2003) as the extent to which well-established methods are applied to data collection and analysis, with relevance to the research aims and objectives. Credibility was established by careful consideration of ethical, religious and cultural issues, as well as by logically establishing a research method. The researcher aimed to interpret the nurses' meaning of 'safe medication administration' in the fullest possible sense. The aim of the researcher was to obtain and discover what is needed for achieving the aim of the study about the causes for medication errors from nurses in the selected hospitals. This was achieved through the truth of the research data and the way the researcher interprets the data (Morse, 2003). In addition, (Denzin & Lincoln, 1994) described credibility as assurance of reasonable and persuasive interpretation and conclusions. Within the cultural context, nurses from different nationalities in Saudi Arabia were able to use their own words to explain their opinion about medication errors in Saudi Arabian health settings. During the initial part of the interviews, the researcher informally discussed whatever issues the nurses raised and gained some understanding of how the nurses felt, what their needs were and their experience of nursing. The interview was based around prepared questions that stemmed from the primary research aims. Using mixed methods facilitated triangulation to strengthen the credibility of the study. The findings were compared with existing findings published in the literature to enable literature sensitivity (Corbin & Strauss, 2008).

### **Transferability**

Transferability is the qualitative equivalent of generalisability and refers to the extent to which the research results can be applied in other settings or groups as part of the trustworthiness of the research (Morse, 2003). Transferability refers to how the findings are generalised from samples in the whole group (Mason, 2004), which, in this case, were both

international and the Saudi nurses in Ha'il province hospitals. The researcher drew data from nurses representing a variety of different circumstances. The maximum variation sampling technique enabled the researcher to select participants with a range of characteristics, thus giving a holistic view of the subject under study. The transferability criterion also focuses on general similarities of findings under similar environmental conditions, contexts or circumstances (Morse, 2003). This means the transferability criterion could be assured by other researchers doing further research along the same lines. A narrowly focused purposeful sampling strategy for qualitative analysis that complements a broader focused probability sample for quantitative analysis may help to achieve a balance between increasing inference quality/trustworthiness (internal validity) and generalizability/transferability (external validity). The sampling plan should allow the researcher to transfer/generalize the conclusions of the study to other settings or populations.

### **Dependability**

Dependability refers to the extent to which the methodology and methods are explained to allow other authors to replicate the study (Guba & Lincoln, 1985). It is difficult to define validity and reliability within qualitative research as this type of research is not concerned with statistical representativeness (Denzin & Lincoln, 2005). There are different processes by which dependability can be established in qualitative research. These processes encompass a comprehensive description of the study findings in writing up, including the socio-cultural background within which the study is undertaken and using a second researcher to confirm the analysis and getting more reliable information (Murphy & Dingwall, 2003).

As qualitative research is a subjective process it is important that the researcher recognises their role in the research process and how they may have affected the collection and analysis of data (Guba, 1985). Reflexivity is perceived as an integral process in qualitative research whereby the researcher reflects continuously on how their own actions, values and perceptions impact upon the research setting and can affect data collection and analysis (Gerrish and Lacey, 2006). In this study, the researcher acknowledged his position in the research process as influencing the findings. For example, his position as a hospital Supervisor at one of the research sites and his gender may have influenced the information participants disclosed in their interviews. His knowledge of the Saudi hospital culture and

knowledge of medication errors will have influenced his interpretation of the data, highlighting the importance of member checking. Typically, member checking is viewed as a technique for establishing the validity of an account. Lincoln and Guba posit that this is the most crucial technique for establishing credibility.

### **Confirmability**

Confirmability is achieved in qualitative research when the researcher ensures that the research results accurately represented the participants' points of view in the study phases (Denzin & Lincoln, 2005). Denzin & Lincoln, (2005) indicated that confirmability is the confirmation of findings, conclusions and recommendations through the data obtained. This implies agreement between the researcher's interpretation and the actual evidence and outcomes. All interviews were conducted by the same researcher with audio tape-recordings (Miles & Huberman, 2002). The audio recording of the participants' views facilitated credibility and confirmability of the data collection process. To ensure confirmability, following an initial reading of the interview transcripts and definition of the initial themes, the researcher met with the interviewees to present their interpretation of the data (member checking). The interviewee had the opportunity to clarify whether the researcher had interpreted their experience correctly, for example the local accent and informal medical terms related to the Saudi accent.

However, because the anonymous survey responses were not linked to participants taking part in the interviews and the questions asked were different, it cannot be claimed that triangulation of the interview and survey data facilitated confirmability of the findings as such however, triangulating the qualitative and quantitative data sources limited bias, increased depth of understanding and enabled a holistic understanding of the topic under study (Murphy & Dingwall, 2003); thus contributing to the overall validity of the findings.

### **Summary of the chapter**

The aim of this study was to investigate nurses' perceptions of medication administration errors in hospitals in the Ha'il region of Saudi Arabia. The study adopted a mixed method study design with a sample taken from qualified nurses working in hospitals in Saudi Arabia exploring four main topics; i) nurses' experience on medication administration errors, ii) the error reporting barriers from nurses' perspective, iii) contributing factors that may influence

medication administration in health care settings in Saudi Arabia, and iv) the strategies that might minimise the number of errors including nurses' education and preparation to provide safe medication administration. The study was performed in three hospitals in region of Ha'il in the north of Kingdom of Saudi Arabia offering care for patients with different medical conditions.

Data was obtained using a questionnaire developed from the literature. Questionnaires were translated involving an expert panel of bilingual (English and Arabic) nurses and tested prior to the main study commencing through a pilot study which established the equivalence of items and concepts. The opportunity was offered to nurses to select the language they preferred to complete the questionnaire and increased the validity of results. The questionnaire survey was supplemented by face-to-face semi-structured interviews to gain a more in-depth view on the nurses' perceptions of medication administration errors. Following pilot interviews, the interview schedule was revised to incorporate hypothetical scenarios with the aim of allowing nurses to speak more freely regarding how they would behave in particular situations following a medication error. This mixed method approach strengthened the study by minimising the weaknesses of quantitative and qualitative approaches through triangulation.

## **Chapter 4 : Questionnaire Findings**

### **Introduction**

This chapter presents a survey as part of larger study exploring nurses' experiences in medication administration, medication errors and their perceptions on contributory factors to errors and their professional role and responsibility to report and manage medication administration errors in Saudi Arabia. This survey was broad and wide in nature, and its findings are reported below and then combined with the more in-depth qualitative study (Chapter 5) in the discussion (Chapter 6) to build a more complete picture of nurses' experiences and perceptions regarding medication administration errors in Saudi Arabia.

This Chapter presents the findings following a well-defined structure with headings as follows:

- Demographic data and professional characteristics
- Nurses' experiences in medication administration
- Causes and contributing factors of medication administration errors
- Strategies to minimise medication errors
- Reporting medication errors
- Views on barriers/facilitators to report errors
- Limitations of the study
- Summary of the chapter

Throughout this chapter findings from the questionnaire will be compared with individual personal and professional characteristics of nurses using appropriate statistical tests to clarify the impact of these characteristics on the target concepts in the study.

### **Sample demographics**

The survey sought to approach all nurses at the three participating hospitals (816 nurses), however, 139 were not occupying nursing roles and 59 were not accessible to receive the questionnaire, giving a total of 618 nurses available and invited to participate in the study



(Table 4.1). Two hundred and forty-six participants completed and returned the questionnaire giving a response rate of 39.8%. This figure was within the range of response rate in similar studies which make the response rate for the current study reasonable (Edwards et al., 2003).

**Table (4.1): Staff numbers employed at 3 hospitals during data collection period.**

<b>Hospital</b>	<b>Female</b>	<b>Male</b>	<b>Total</b>
King Khalid	336	31	367
Hail General	209	25	234
Maternity Hospital	215	0	215
Sub-totals	760	56	816
Excluded for non-nursing roles	-	-	139
Undelivered	-	-	59
Total staff included in distribution			618

Table 4.1 shows the number of staff who received the questionnaire. The respondents (shown in Table 4.2) included 84 Asian nurses (35.6%), 77 (32.6%) Saudi nurses, 65 Indian nurses (27.5%), and only 9 (3.8%) nurses from other nationalities; eight European, one African and one who did not report nationality. It is clear that this demographic data demonstrates the multicultural nature of the workforce at the selected hospitals. The sample included 26 males (11%) and 210 females (89%) (Table 4.2). The majority of nurses 150 (63.6%) fell within the age group of 22-30 years, the least age group of participants 4 (1.8 %) was the young group (18-21 years). Regarding the first language of respondents in this multicultural society, English language was not first language for the majority of workforce, the most commonly spoken languages of nurses was Arabic 78 (33.1%) with 58(24.5)% using Indian language. There were only 24(10%) whose first language was English which confirms the high diversity of participants.

**Table (4.2): Demographic data (n = 236)**

<b>Item</b>		<b>Frequency</b>	<b>Percent (%)</b>
<b>Nationality</b>	Saudi Arabian	77	32.6
	Asian	84	35.6
	Indian	65	27.6
	European	8	3.4
	African	1	0.4
	Missing	1	0.4
<b>Gender</b>	Male	26	11.0
	Female	210	89.0
<b>Age</b>	18-21	4	1.8
	22-30	150	63.6
	31-40	49	20.8
	41-50	24	10.2
	51 <sup>+</sup>	8	3.4
	Missing	1	0.4
<b>First language</b>	Arabic	78	33.1
	Asian Language Group	70	29.7
	Indian Language Group	58	24.5
	English	24	10.2
	European Language Group	2	0.8
	Missing	4	1.7

Table (4.3) includes details on professional and academic qualifications. Regarding professional and educational characteristics, more than half of participants (55.1%) obtained a Bachelor degree in nursing science as their highest qualification, 43% obtained high school certificate or Diploma, and only 0.8 had a Master's degree in nursing. The majority of participants were first qualified in Asia (62.4%) of these, 25.4% were qualified in India. There were 68 nurses (28.8%) who were qualified in Saudi Arabia. Regarding nurses' qualifications, the vast majority were qualified in general nursing (88.6%). More than half of nurses in the study had more than three years' experience in the field. In summary the majority of nurses were educated outside Saudi Arabia and only half were educated to degree level.

**Table (4.3): Professional and Educational characteristics of nurses (n=236)**

Item		Frequency	Percent (%)
<b>Country of First Qualification</b> <i>[Location of the qualification]</i>	Asian	147	62.4
	Saudi Arabia	68	28.8
	Europe	16	6.8
	Africa	3	1.3
	Australia	2	0.8
<b>Highest Academic Qualification</b>	Diploma/High School	102	43.3
	Bachelor	130	55.1
	Master's Nursing	2	0.8
	Master's Non-Nursing	1	0.4
	Missing	1	0.4
<b>Field of First Qualification</b>	General Nursing	209	88.6
	Paediatric Nursing	8	3.4
	Midwifery	8	3.4
	Mental Health	6	2.5
	Learning Disability	1	0.4
	Missing	4	1.7
<b>Years in the Current Post</b>	< 1 year	54	22.9
	Between 1 and 2 yrs	34	14.4
	Between 2 and 3 yrs	28	11.9
	>3 yrs	119	50.4
	Missing	1	0.4

## Nurses' Experiences in Medication Administration and Errors

This section presents data relating to the respondent's experience of medication administration, frequency of drug administration, and the extent to which nurses were independent while administering medications and the way nurses prioritise and order the rights of medication administration according to their importance. The number of errors they had been involved in or witnessed is also presented.

**Table (4.4): Frequency and independency of drug administration**

	<b>At least once each shift</b>	<b>At least twice each shift</b>	<b>Once or twice a week</b>	<b>Less than once a week</b>
	N(%)	N(%)	N(%)	N(%)
<b>How often administer under supervision</b>	54(22.9)	23(9.7)	40(16.9)	103(43.6)
<b>How often administer jointly with another nurse</b>	53(22)	32(13.6)	51(21.6)	88(37.3)
<b>How often administer independently</b>	94(39.8)	73(30.9)	17(7.2)	40(16.9)

The above table (4.4) shows that nurses are administering medications frequently perhaps once or twice a shift. In terms of working independently, the majority of respondents worked independently at least once or twice each shift, nearly 40% and 30% respectively. A relatively high number of nurses administered medications only once a week under supervision (43.6%) or jointly with another nurse (37.3%).

### Experience of medication errors

Respondents were asked about their experience of medication errors in a number of ways, in relation to those they had witnessed, and in relation to those they had made, witnessed and reported. These findings were inconsistent. As can be seen from table 4.5, just over 20% respondents had made an error in the last 12 months (whether resulting in potential harm or not), however less than half of the nurses had reported the error. This suggests that reporting errors was considered by a limited number of nurses and not for all errors (i.e. an underreporting of errors). Only 8 (3.4%) said they have made at least one error which

resulted in potential harm and 41 (17.4%) said that they have made at least one error which resulted in no harm. A total of 82.6% of nurses admitted that they had not made a medication error in the past 12 months that resulted in harm to a patient. Meanwhile, 96.6% reported they had not made even one error that had resulted in some type of harm to the patient. It should be noted that nurses were only asked to report on errors in the last 12 months, asking for information over a longer time period may have affected the responses to this question. In this question (Table 4.5) nurses also reported that they had observed other nurses making errors (22.8%).

**Table 4.5: Number of medication administration errors made by nurses**

	Agree	Disagree
	N(%)	N(%)
Have made at least one error resulting in no harm	41(17.4)	195(82.6)
Have made at least one error resulting in potential harm	8(3.4)	228(96.6)
Have observed errors by another	54(22.8%)	182(77.2)
Have reported an error I made	23 (9.7%)	213(72.5)

In a separate question, when nurses were asked whether they had witnessed “actual” errors by another nurse in the last year prior to being approached for this study; only thirty-three nurses (14%) said they have witnessed an actual medication administration error (Table (4.6), lower than the figure for a similar question above.

**Table 4.6: Witnessed actual error**

	Yes	No
	N(%)	N(%)
Witnessed actual error	33(14)	197(83.5)

When nurses who had witnessed actual errors were asked about how the errors had occurred in relation to the five rights of medication administration, they said that they had errors in all “rights”, 6.8% of these errors were with patients, 5.9% with medication, 5.1% with time, the least errors (3.5%) were found with the route of medication. Table (4.7) shows the types of error witnessed according to the 5 rights of medication administration.

**Table (4.7): Errors witnessed according to 5 rights**

	Actual error N(%)
Patient	11(4.7)
Dose	6(2.5)
Route	4(1.7)
Time	8(3.4)
Medication	3(1.3)
Missed	1(0.4)
N/A	201(85.2)

This section presents part of the findings that relate to the objective regarding nurses' responsibility to report and manage medication errors, exploring their views on the importance and the order of rights of medication administration. Nurses were asked to rate the most and least important right they considered when administering medications; right patient, right dose, right route, right time, right medication (Table 4.8). Although nurses made most of their errors with the "right patient" (see Table 4.7), the majority of them (77.1%) considered the right patient as the most important right with the least important right being the right time which was agreed by 73.3% of nurses. As can be seen from the table below, some nurses considered all rights important, whilst 1 nurse suggested that all rights are least important. This could indicate that they believe all rights are equally important or there may have been potential confusion with some respondents regarding the wording of the question.

**Table (4.8): The most and least important**

	The most important	The least important
	N(%)	N(%)
Right patient	182(77.1)	6(2.5)
Right dose	12(5.1)	1(0.4)
Right route	2(0.8)	10(4.2)
Right time	0(0)	173(73.3)
Right medication	7(3)	5(2.1)
All marked	16(6.8)	1(0.4)

### **Contributing factors to medication administration errors**

Respondents were asked about the extent to which they agreed on nineteen contributory factors to medication errors drawn from the literature review. The top or most common five contributing factors of medication error that were agreed (agree and strongly agree) by nurses were high workload (82.6%), lack of familiarity with medications (81.4%), high patient to nurse ratios (80%), poor handwriting by doctor (79.7%); inadequate initial nurse training (79.6%), However, the difference between all contributing factors was marginal which suggests that all causes were agreed by nurses to increase medication errors (Table 4.9).

**Table 4.9: Contributing factors**

	Strongly disagree	Disagree	Agree	Strongly A	Agree + strongly A
	N (%)	N (%)	N (%)	N (%)	N (%)
High workload	7(3)	32(13.6)	82(34.7)	113(47.9)	195(82.6)
Pressure to complete medications quickly	7(3)	47(19.9)	90(38.1)	90(38.1)	180(76.2)
Lack of familiarity with medications	15(6.4)	25(10.6)	113(47.9)	79(33.5)	192(81.4)
Inadequate initial nurse training	15(6.4)	28(11.9)	106(44.9)	82(34.7)	188(79.6)
Lack of supervision for inexperienced staff	17(7.2)	31(13.1)	100(42.4)	86(36.4)	186(78.8)
Interruptions to medicine round	13(5.5)	38(16.1)	120(50.8)	50(25)	170(75.8)
Poor quality control (ie failure to follow procedures)	6(2.5)	53(22.5)	131(55.5)	40(16.9)	171(72.4)
High patient to nurse ratios	11(4.7)	32(13.6)	65(27.5)	124(52.5)	189(80)
Poor handwriting by doctor	12(5.1)	31(13.1)	75(31.8)	113(47.9)	188(79.8)
Lack of experience of newly qualified nurses	15(6.4)	35(14.8)	100(42.4)	81(34.3)	181(76.7)
Unclear verbal instructions between doctors and nurses	10(4.2)	43(18.2)	82(34.7)	98(41.5)	180(76.2)
Drugs with similar appearance or names	5(2.1)	50(21.2)	95(40.3)	81(34.3)	176(74.6)
5 rights not followed	30(12.7)	35(14.8)	70(29.7)	95(40.3)	165(70)
Large number of medications	22(9.3)	43(18.2)	95(40.3)	68(28.8)	163(69.1)
High levels of patient need	17(7.2)	56(23.7)	78(33.1)	78(33.1)	156(66.2)
Lack of medication competence	20(8.5)	56(23.7)	85(36)	66(28)	151(64)
Misunderstandings due to language differences between nurses	26(11)	55(23.3)	87(36.9)	63(26.7)	150(63.6)



### **Comparing findings between groups, comparing rankings between groups**

As the health system in Saudi Arabia is a multicultural system, it was presumed that countries of origin may differ in the way they teach and train nurses and this might lead to different beliefs and perceptions in what nurses from different countries believe about what factors contribute to medication errors and how they manage these errors. Analysing this will allow an understanding from a multicultural perspective and how this can be managed in the future. Thus, statistical tests were used for comparing nurses' responses between nurses from different personal and professional groups including original countries. Prior to selecting the proper statistical test for comparing nurses' responses between these groups, it was crucial to remember that the type of questions in the study questionnaire were all Likert Scale questions (nominal and ordinal questions) and this type of data collected through this scale does not fulfil the requirements necessary to use parametric tests. Therefore, non-parametric tests were used to compare nurses' responses between groups in the study. For example, *Chi-Square* was used for categorical data like yes/no between male and females (2\*2 categories), *Mann Whitney U* test to compare nurses' responses between two groups, and *Kruskal Wallis* to compare these responses between three or more groups. The significance level was set at  $p=0.05$ , if it's below this number the hypothesis will be rejected.

### **Comparing nurses' rankings on individual items**

Although the difference between items appears marginal, the data was analysed by a range of variables to present a more detailed picture and compare the most common five individual items of "contributing factors" part of the questionnaire with nurses' demographic and academic/professional characteristics. The most common five factors of medication errors were "high workload", "lack of familiarity with medication", "high patient to nurse ratios", "inadequate initial nurse training", and "poor handwriting by doctor".

#### ***High workload***

To examine "high workload", the null hypothesis would be:

***H<sub>0</sub>: Nurses' responses on the item "high workload" will be similar across demographic and professional characteristics***

In order to test this hypothesis, Mann Whitney U test and Kruskal Wallis test were used to compare nurses' responses on these items between demographic and professional

characteristics. Responses on “high workload” was not significantly different with demographic characteristics of nurses; nationality ( $Kruskal = 3.4, df=4, p=0.5$ ), gender ( $Mann\ Whitney\ U=-1.17, p=0.24$ ), age ( $Kruskal = 2.99, df=4, p=0.6$ ), and first language spoken ( $Kruskal = 7.8, df=4, p=0.1$ ), so the null ***hypothesis was accepted***. When the “high workload” was compared to academic and professional characteristics, there was also no significant difference between nurses according to any of these characteristics; country of first qualification ( $Kruskal = 4.3, df=5, p=0.5$ ), the highest academic qualification ( $Kruskal = 2.2, df=4, p=0.7$ ), field of first qualification ( $Kruskal = 6.8, df=4, p=0.15$ ), and years in the current post ( $Kruskal = 2.6, df=3, p=0.45$ ), so the null ***hypothesis was accepted***. Therefore, regardless of demographics, high workload was the single most perceived contributory factor.

### ***Lack of familiarity with medications***

To examine “lack of familiarity with medications”, the hypothesis would be

***Ho: Nurses’ responses on the item “lack of familiarity with medications” will be similar between demographic and professional characteristics***

Again, the nationality and age, also influenced nurses’ familiarity with medications and statistics and there was a significant difference in responses of nurses from different nationalities, and different age groups on this item ( $Kruskal = 12.8, df=4, p=0.012$ ), and ( $Kruskal = 9.6, df=4, p= 0.049$ ) respectively, so the null ***hypothesis was rejected***. However, there were no significant differences in their responses according to each regarding first language spoken ( $Kruskal = 6, df=4, p=0.18$ ), gender ( $Mann\ Whitney\ U = - 0.51, p=0.6$ ), different country of qualification ( $Kruskal = 8.1, df=5, p=0.15$ ) or different levels of academic qualifications ( $Kruskal= 8.8, df=4, p=0.07$ ) so the null ***hypothesis was accepted***.

Although the experience in the field may be expected to increase the familiarity of nurses with medications there was no significant difference in the scores on this item with years in the current post ( $Kruskal = 2.3, df=3, p=0.5$ ) nor with nurses’ field of first qualification ( $Kruskal = 6.2, df= 4, p= 0.18$ ), so the null ***hypothesis is accepted***. This provides a mixed response suggesting potential cultural and age related factors on the one hand nationality and age being significant, but not on another language and years in current post being non-significant. This requires further exploration in the interviews.

### ***High patient to nurse ratios***

To examine the perception, high patient to nurse ratios, it was hypothesised that

***Ho: Nurses' responses on the item "high patient to nurse ratio" will be similar between demographic and professional characteristics***

There was no significant difference of responses between demographic and professional groups of nurses; gender (*Mann Whitney U* = - 0.36, *p*=0.7), nationality (*Kruskal*= 7.4, *df*=4, *p*=0.12), and age (*Kruskal*= 4.2, *df*=4, *p*=0.38), country of first qualification (*Kruskal* = 4.9, *df*=5, *p*=0.43), the highest academic qualification (*Kruskal* = 2.9, *df*=4, *p*=0.58), and years in the current post (*Kruskal* =4, *df*=3, *p*=0.26), so the null ***hypothesis was accepted***. This finding was expected to be similar between all groups as it is considered as basic nursing issue throughout the world, but there was significant difference according to "first language spoken (*Kruskal*=11.8, *df*=4, *p*=0.02) and "field of first qualification (*Kruskal* = 10.9, *df*=4, *p*=0.03) as it was expected that this item to be perceived by all nurses in all groups, so the null ***hypothesis was rejected*** suggesting potential cultural differences.

### ***Poor doctor's handwriting***

To examine the hypothesis for the "poor handwriting by doctor"

***Ho: Nurses' responses on the item "poor handwriting by doctor" will be similar between demographic and professional characteristics***

This factor was not significantly different between nurses in all groups (demographic, academic and professional); gender (*Mann Whitney U* =- 0.32, *p*=0.75), age (*F*=0.2, *df*=2, *p*=0.8), nationality (*F*=1.2, *df*=2, *p*=0.9) and first language spoken (*Kruskal*=0.9, *df*=4, *p*=0.91), country of first qualification (*Kruskal* = 5.7, *df*=5, *p*=0.34), highest academic qualification (*Kruskal* = 1.9, *df*=4, *p*=0.76), field of first qualification (*Kruskal* = 3, *df*=4, *p*=0.52), or years in current post (*Kruskal* = 4.4, *df*=3, *p*=0.22), so the null ***hypothesis was accepted*** suggesting that regardless of demographics, doctors' poor handwriting is a perceived contributory factor to medication administration errors.

### ***Initial nurse training***

With regard to the adequacy of initial nurse training, it was hypothesised that

***Ho: Nurses' responses on the factor "inadequate initial nurse training" will be similar between demographic and professional characteristics***

This hypothesis was tested statistically with a significant difference of nurses' scores on this item was found between nurses from different nationalities ( $Kruskal = 12, df=4, p=0.012$ ), different field of first qualification ( $Kruskal = 1.6, df=1, p=0.2$ ), and different age groups ( $Kruskal = 9.6, df=4, p=0.04$ ), so the null ***hypothesis was rejected***. There was no significant difference between those with different first language spoken ( $Kruskal = 6.3, df=4, p=0.18$ ), males and females ( $Mann\ Whitney\ U = -0.33, p=0.74$ ), country of first qualification ( $Kruskal = 8, df=5, p=0.15$ ), years in the current post ( $Kruskal = 2.3, df=3, p=0.5$ ) and highest academic qualification ( $Kruskal = 8.8, df=4, p=0.07$ ) so the null ***hypothesis was accepted***. This provides a mixed response initially suggesting cultural and professional differences, but not for all variables.

In summary, the top five contributing factors agreed by nurses to increase medication administration errors were high workload, lack of familiarity with medications, high patient/nurse ratio, poor hand writing by doctors, and inadequate initial nurse training. The only factor believed to increase medication errors in all groups was the high workload. Familiarity with medications was significantly different between nurses who spoke different languages, were from different nationalities and countries of first qualification suggesting that culture may also be a factor and may influence these perceptions. Nationality, age and first field of qualification were also significantly influencing nurses' initial training suggesting that cultural beliefs and knowledge may influence perceptions as well.

Regarding factors "high patient to nurse ratios", "poor handwriting by doctor", nurses from all demographic, academic, and professional groups agreed on the factor (poor handwriting by doctors) with the first factor (high patient to nurse ratio) differed between nurses speaking different languages and those having different fields of first qualification which also suggests potential cultural differences in perceptions. These differences will be further explored in later chapters.

## Strategies to minimize medication errors

Respondents were asked to note the extent of their agreement with eight strategies (identified from the literature) which have the potential to prevent or reduce medication errors (See Table 4.10). Although the difference between nurses' responses was marginal, ordering by (Agree + strongly agree) identified the following top three strategies for perceived potential to minimise medication errors: report errors whether harm occurs or not (91.1%), managers should monitor errors (88.5%), and my hospital procedures are effective for patient safety (86%). This suggests that appropriate systems and procedures need to be in place to reduce errors and encourage staff to report them. The following three factors also agreed highly by nurses were; use of dispensing technology can reduce errors 80.1%, use of bar codes can reduce errors (74.1%), the patient or family has a right to be told about errors whether harm occurs or not (66.1%), with the least factor being my hospital medication procedures promote errors (31%), with the latter suggesting perhaps that nurses believe that their hospital procedures are useful in preventing errors.

**Table 4.10: Nurses' responses on possible strategies to minimize medication errors**

	Strongly disagree	Disagree	Agree	Strongly agree
	N(%)	N(%)	N(%)	N(%)
Report errors whether harm occurs or not	1(0.4)	6(2.5)	119(50.4)	96(40.7)
Managers should monitor errors	0(0)	13(5.5)	140(59.3)	69(29.2)
Hospital procedures effective for patient safety	2(0.8)	17(7.2)	143(60.6)	60(25.4)
Dispensing technology can reduce errors	1(0.4)	28(11.9)	148(62.7)	41(17.4)
Bar codes can reduce errors	6(2.5)	35(14.8)	124(52.5)	51(21.6)
Patient has right to be told about errors	6(2.5)	55(23.3)	118(50)	38(16.1)
Hospital procedures cause stress	17(7.2)	106(44.9)	57(24.2)	39(16.5)
Hospital procedures promote errors	36(15.3)	106(44.9)	53(22.5)	20(8.5)

### **Comparing nurses' responses between groups**

Similar to the data analysis plan used in the previous section, Mann Whitney U and Chi-Square Kruskal were used to compare nurses' responses between demographic, academic and professional characteristics of nurses in the study.

#### ***Reporting whether harm occurs or not***

The first item that was agreed by the majority of nurses was "Report errors whether harm occurs or not", it was hypothesised that

***Ho: Nurses' responses on the item "report errors whether harm occurs or not" will be similar between demographic and professional characteristics***

The only variable influencing this factor was the language with significant difference of nurses' responses between those who speak different languages ( $Kruskal=14.9$ ,  $df=4$ ,  $p=0.005$ ), so the null ***hypothesis is rejected*** with no significant difference found between those from other groups; age ( $Kruskal=8.8$ ,  $df=4$ ,  $p=0.07$ ), gender ( $Mann\ Whitney\ U = -0.97$ ,  $p=0.33$ ); nationality ( $Kruskal=2.6$ ,  $df=4$ ,  $p=0.63$ ); country of first qualification ( $Kruskal=3.8$ ,  $df=5$ ,  $p=0.58$ ); highest academic qualification ( $Kruskal=1$ ,  $df=4$ ,  $p=0.9$ ); field of first qualification ( $Kruskal=8.5$ ,  $df=4$ ,  $p=0.075$ ); and years in the current post ( $Kruskal=2$ ,  $df=3$ ,  $p=0.56$ ) so the null ***hypothesis was accepted***. This does not show consistency for cultural variables, for example when nurses from all nationalities and countries of first qualification were similar in their responses then those who spoke different languages were also expected to be similar.

#### ***Managers should monitor errors***

This was followed by the item "Managers should monitor errors", and it was hypothesised that

***Ho; Nurses' responses on the item "Managers should monitor errors" will be similar between demographic and professional characteristics***

A significant difference was found only between nurses according to nationality ( $Chi-Square\ Kruskal= 10.6$ ,  $df=4$ ,  $p=0.03$ ), country of first qualification ( $Kruskal=11.6$ ,  $df=5$ ,  $p=0.04$ ), and first language spoken ( $Kruskal=18$ ,  $df=4$ ,  $p=0.001$ ), so the null ***hypothesis was rejected***. All nurses from other groups believed that managers should monitor errors with no significant difference; in, gender ( $Mann\ Whitney\ U = -0.43$ ,  $p=0.67$ ), highest academic qualification ( $Kruskal=3.9$ ,  $df=4$ ,  $p=0.42$ ), age ( $Kruskal=9$ ,  $df=4$ ,  $p=0.06$ ), field of first

qualification ( $Kruskal=7.3$ ,  $df=4$ ,  $p=0.12$ ), and years in current post ( $Kruskal=0.97$ ,  $df=3$ ,  $p=0.8$ ), so the null ***hypothesis was accepted***. This suggests that it is cultural issue rather than professional issue with regard to the belief that it is the role of managers to monitor errors.

### ***Hospital procedures are effective for patient safety***

Regarding the item “*Hospital procedures are effective for patient safety*”, it was hypothesised that

***Ho; Nurses’ responses on the item “Hospital procedures effective for patient safety” will be similar between demographic and professional characteristics***

A significant difference was found between nurses according to their gender ( $Mann\ Whitney\ U = -2.2$ ,  $p=0.03$ ) and the field of first qualification ( $Kruskal=12$ ,  $df=4$ ,  $p=0.015$ ), so the null ***hypothesis was rejected***. Nurses from other groups believed that hospital procedures were effective for patient safety with no significant difference in; age ( $Kruskal=3$ ,  $df=4$ ,  $p=0.55$ ), nationality ( $Kruskal=2.9$ ,  $df=4$ ,  $p=0.58$ ), country of first qualification ( $Kruskal=3.5$ ,  $df=5$ ,  $p=0.6$ ), first language spoken groups ( $Kruskal=8.6$ ,  $df=4$ ,  $p=0.07$ ), highest academic qualification ( $Kruskal=4$ ,  $df=4$ ,  $p=0.4$ ), and years in current post ( $Kruskal=4$ ,  $df=3$ ,  $p=0.24$ ), so the null ***hypothesis is accepted***. As the responses for all nationalities were similar, those with different language were also expected to be similar, this discrepancy suggests an issue which may require clarification in the qualitative interviews.

As with other factors, it appears that cultural issues may be playing a part in differences in perceptions as significant differences were found for language in relation to “errors should be reported whether harm occurs or not” and in relation to nationality and country of first qualification for “managers should monitor errors”, although these were not significant across all potential cultural factors and therefore not consistent. This was not the case for “hospital procedures should be effective for patient safety” which was not influenced by any cultural factor but gender and field of first qualification. maybe this a professional issue playing a part in differences in perceptions.

### **Barriers/facilitators to report errors**

As noted above when asked about the errors that they had made, and whether they had reported them, the findings were inconsistent but with an indication that there is a potential under reporting of errors (table 4.11).

Respondents were asked to rate eight statements each of which represented a reason why or why not to report medication errors identified from the literature (barriers and facilitators). Each statement was rated as strongly disagree, disagree, agree and strongly agree. The top barrier was “others do not report because fear of punishment” agreed by 50% of nurses (agree + strongly agree) with the top facilitator was “nurses have a duty to report” which was agreed by 91.5% of nurses (see Table 4.11 below).

**Table 4.11: Barriers and facilitators for reporting errors**

	Strongly disagree	Disagree	Agree	Strongly agree
	N(%)	N(%)	N(%)	N(%)
<b><i>Barriers</i></b>				
Others do not report because fear of punishment	28(11.9)	86(36.4)	83(35.2)	35(14.8)
Different professional views of errors result in no reporting	15(6.4)	98(41.5)	95(40.3)	22(9.3)
Different cultural views of errors result in no reporting	25(10.6)	93(39.4)	90(38.1)	22(9.3)
Not reported error due to fear of punishment	66(28)	120(50.8)	33(14)	11(4.7)
<b><i>Facilitators</i></b>				
Nurses have a duty to report	2(0.8)	12(5.1)	128(54.2)	88(37.3)
Nurses who report their own errors should be supported with additional training	0(0)	18(7.6)	127(53.8)	86(36.4)
Sanctions should be proportionate	1(0.4)	47(19.9)	129(54.7)	47(19.9)
Better to ignore errors in some circumstances	84(35.6)	100(42.4)	32(13.6)	13(5.5)



## Comparing individual items between groups

### *Barriers*

When the barrier “others do not report because of fear of punishment” was compared between nurses in different groups it was hypothesised that

***Ho: Nurses’ responses on the item “Others do not report because of fear of punishment” will be similar between demographic and professional characteristics***

A significant difference was found according to nurses’ nationality ( $Kruskal = 71.4$ ,  $df=4$ ,  $p=0.001$ ), gender ( $Mann\ Whitney\ U = -2.4$ ,  $p=0.016$ ), age ( $Kruskal=12.8$ ,  $df=4$ ,  $p=0.013$ ), first language spoken ( $Kruskal = 62.8$ ,  $df=4$ ,  $p=0.001$ ), country of first qualification ( $Kruskal = 59.5$ ,  $df=5$ ,  $p=0.001$ ), and years in the current post ( $Kruskal = 10.8$ ,  $df=3$ ,  $p=0.013$ ). The difference was not significant according to highest academic qualification ( $Kruskal = 5.4$ ,  $df=4$ ,  $p=0.25$ ) and field of first qualification ( $Kruskal = 4.9$ ,  $df=4$ ,  $p=0.3$ ). This suggests cultural, experience and gender differences in the responses.

Regarding the “Different professional views of errors result in no reporting” barrier it was hypothesised that

***Ho: Nurses’ responses on the item “Different professional views of errors result in no reporting” will be similar between demographic and professional characteristics***

A significant difference was found regarding this item between nurses from different nationalities ( $Kruskal = 60$ ,  $df=4$ ,  $p=0.001$ ), gender ( $Mann\ Whitney\ U = -2.23$ ,  $p=0.03$ ), age groups ( $Kruskal = 20.8$ ,  $df=4$ ,  $p=0.001$ ), different first language spoken ( $Kruskal = 53$ ,  $df=4$ ,  $p=0.001$ ), years in the current post ( $Kruskal = 2$ ,  $df=3$ ,  $p=0.02$ ) and country of first qualification ( $Kruskal = 48.7$ ,  $df=5$ ,  $p=0.001$ ). However, there was no significant difference found between nurses according to their highest academic qualification ( $Kruskal = 5.9$ ,  $df=4$ ,  $p=0.2$ ), and field of first qualification ( $Kruskal = 4.84$ ,  $df=4$ ,  $p=0.3$ ). This suggests cultural, experience and gender differences in the responses.

The third item rated by nurses was “Different cultural views of errors result in no reporting” which was hypothesised that

***Ho: Nurses’ responses on the item “Different cultural views of errors result in no reporting” will be similar between demographic and professional characteristics***

There was a significant difference found between nurses according to their nationality ( $Kruskal = 67.6$ ,  $df=4$ ,  $p=0.001$ ), age ( $Kruskal = 16$ ,  $df= 4$ ,  $p=0.03$ ), gender ( $Mann\ Whitney\ U = -2.2$ ,  $p=0.03$ ), first language spoken ( $Kruskal = 58.8$ ,  $df=4$ ,  $p=0.001$ ), and country of first qualification ( $Kruskal = 58.8$ ,  $df=5$ ,  $p=0.001$ ). Nurses’ responses were not significantly different according to their highest academic qualification ( $Kruskal = 8.4$ ,  $df=4$ ,  $p=0.07$ ), field of first qualification ( $Kruskal = 6.2$ ,  $df=4$ ,  $p=0.2$ ), and years in the current post ( $Kruskal = 5.7$ ,  $df=3$ ,  $p=0.13$ ). This suggests cultural, experience and gender differences in the responses.

### *Facilitators*

With regard to the influence of nurses’ demographic characteristics, it was hypothesised that

***Ho: Nurses’ responses on “have the duty to report” will be similar between nurses in all demographic and academic/professional groups***

Statistical Mann Whitney U test and Kruskal test were also used to test the hypothesis with regard to the top three barriers rated by nurses. There was no significant difference in nurses’ responses about “nurses have the duty to report” barrier when compared with gender ( $Mann\ Whitney\ U = -0.57$ ,  $p=0.6$ ), age ( $Kruskal = 6.4$ ,  $df=4$ ,  $p=0.17$ ), nationality ( $Kruskal = 6.4$ ,  $df=4$ ,  $p=0.018$ ), and first language spoken ( $Kruskal = 7.6$ ,  $df=4$ ,  $p=0.11$ ), the null ***hypothesis was accepted*** suggesting no cultural differences. When these responses were compared with academic and professional characteristics of nurses, they were significantly different only with nurses’ years in their current post ( $Kruskal = 8.9$ ,  $3$ ,  $p=0.03$ ), null ***hypothesis was rejected***, but not with other characteristic; years qualified ( $Kruskal = 1.8$ ,  $df=3$ ,  $p=0.6$ ), country of qualification ( $Kruskal = 6.4$ ,  $df=5$ ,  $p=0.23$ ), field of qualification ( $Kruskal = 3.2$ ,  $df=4$ ,  $p=0.5$ ), and highest academic qualification ( $Kruskal = 1.1$ ,  $df=4$ ,  $p=0.9$ ), so the null ***hypothesis was accepted***. This might indicate that nurses have the duty to report errors

regardless of their process of qualification in all nursing fields but it depends on their experience and how long they were in their current job.

The second barrier “own reporting should get support and training” was compared with nurses demographic characteristics and it was hypothesised that

***Ho: Nurses’ responses on “Own reporting should get support and training” will be similar between nurses in all demographic and academic/professional groups***

When testing this hypothesis, nurses’ responses were not significantly different between any of the demographic characteristics; gender (*Mann Whitney U* = -1.2, *p*=0.25), age (*Kruskal*=5.4, *df*=4, *p*=0.23), nationality (*Kruskal*=8, *df*=4, *p*=0.9), and first language spoken (*Kruskal*=7.5, *df*=4, *p*=0.1), so the ***null hypothesis was accepted***. There was also no significant difference in responses between nurses’ ratings according to their years qualified (*Kruskal*=2.5, *df*=3, *p*=0.41), country of qualification (*Kruskal*=8.7, *df*=5, *p*=0.12), field of qualification (*Kruskal*=6.6, *df*=4, *p*=0.16), and highest academic qualification (*Kruskal*=1.8, *df*=4, *p*=0.8), so the ***null hypothesis was accepted***. This suggests that regardless of cultural background, age or experience, all groups would value a supportive environment and further training in relation to error reporting.

Finally, it was hypothesised that

***Ho: Nurses’ responses on the third barrier “sanctions should be proportionate” will be similar between demographic, academic/professional groups***

Testing this hypothesis showed significant difference only with nurses’ nationality (*Kruskal*=11.7, *df*=4, *p*=0.02) and first language spoken (*Kruskal*=13, *df*=4, *p*=0.01), so the ***null hypothesis was rejected***, suggesting potential cultural differences in responses, with no significant difference between groups of gender (*Mann Whitney U* = -0.47, *p*=0.6), age (*Kruskal*=3.4, *df*=4, *p*=0.5), and so the ***null hypothesis was accepted***. When nurses’ ratings were compared to academic/professional characteristics they were significantly different, ***hypothesis rejected***, but not according to years qualified (*F*=1, *df*=4, *p*=0.4), country of first qualification (*Kruskal*=9.5, *df*=5, *p*=0.08), field of qualification (*Kruskal*=2.8, *df*=4, *p*=0.6), or highest academic qualification (*Kruskal*=5.3, *df*=4, *p*=0.25), so the ***hypothesis was accepted***. Again the process of nurses’ qualification in all fields would not be a factor influencing nurses’ beliefs on “sanctions should be proportionate” item.

## **Summary**

Barriers to reporting and views regarding sanctions and punishment appear to be affected by cultural factors, yet the responses to facilitators are more mixed and are not clearly affected by cultural issues. All agree that training is important and there are no differences regarding a nurse's duty to report errors. This suggests that although there may be cultural issues in error management, some professional values are the same.

## **Qualitative section of questionnaire**

In order to maintain anonymity and obtain detailed feedback, space was provided on the questionnaire for nurses to expand on their views e.g. details on nurses' opinions such as the reasons why nurses have chosen any of rights of medication administration or why nurses have chosen "NO" to the questions "did you intervene to prevent the error?", However on the whole these were left blank and did not provide the more detailed data or explanation which was anticipated. This might be because of the length of the questionnaire or the sensitivity of the topic.

## **Limitations of the questionnaire**

Although the response rate was reasonable (38.19%) given the length of the survey and the time needed to complete it, it is unknown whether the results truly captured the views of those who make the errors. For example the non-respondents may be those who are witnessing or contributing to the errors. For those who did respond, the questionnaire only asked about errors that had occurred in the past year, and thus may not reflect the number of errors that the respondents have made. Furthermore the variability in responses to questions regarding the witnessing of errors suggests some underreporting of errors and calls the accuracy of the responses into question. Despite piloting, and careful translation procedures some of the questions may have been misinterpreted or poorly worded, e.g. in relation to the 5 rights. There were other important limitations related to the wording of the questionnaire was presenting some items which were not adequately exclusive. One example of these items was item 4 in the demographic data asked about country and gave options as regions; Europe, Asia, and Australia. Another example, was the item about years since qualifications in which the respondent of 2 years' experience would be confused between option 2 or 3. Further, the items "high workload" and "high patient to nurse ratio" were confusing as both might mean increased workload. Moreover, the items "lack of medication competence" and "lack of familiarity with medications" might also overlap and can be consequently misunderstood.

Furthermore, the item “Hospital procedures cause stress” was addressed in strategies section while it is not a strategy. Although, the use of a likert scale from strongly disagree to strongly agree, provided information on nurses perceptions of contributory factors or strategies to minimize errors, it was only able to provide evidence on whether nurses agreed or disagreed with the statements. Combining the answers sought to provide evidence of which factors nurses believed were the most important, but a more accurate way of doing this would have been to ask nurses to rank which they thought were the most important factors or strategies.

An alternative approach which may have improved the responses from the questionnaire would have been to pilot the questionnaire in English prior to the translation and subsequent pilot or employ the strategies for validation which have been described earlier. Quantitative questionnaires such as these, are only able to provide an overview of the situation, although space was provided for more qualitative responses, however these were not completed, thus more details on nurses’ opinions such as the reasons why nurses have chosen any of rights of medication administration or why nurses have chosen “NO” to the questions “did you intervene to prevent the error?”, “did you challenge the nurse concerned?” and “Have you ever reported a medication administration error by another nurse using your hospital reporting system, were not elaborated. Further, cultural factors such as language may be playing a part in differences in perceptions as significant differences were found. This may become clearer from the qualitative interviews. Insufficient information on the types of actual errors was not provided. Moreover, the questionnaire was unable to sufficiently explore factors behind not reporting errors. One of the objectives of the study was to investigate nurses’ experience of medication errors in Saudi Arabia; exploring nurses’ perceptions on their role and responsibility to report and manage medication errors. According to this aim, it was clear that the data provided by the questionnaire was not sufficient to achieve this aim and the other objective of exploring nurses’ views about factors that may influence medication administration and errors in health care settings. Nurses’ perspectives on their professional role and responsibility to report and manage medication errors were also not well explored to provide evidence base to build up a plan of managing errors. Therefore, a further examination of how nurses perceive these issues was conducted by means of in-depth semi structured interviews, and this will be reported in the next chapter.

## Summary of the chapter

The aim of this study is to investigate nurses' perceptions of medication errors in hospitals in the Ha'il region of Saudi Arabia. Although respondents to the questionnaire frequently administer medication only a small number of respondents had made an error or witnessed an error in the last 12 months. Of those who had made an error, less than half had reported it. This contrasts with their views that it is a nurses' duty to report errors and may correspond with the finding that the highest barrier to reporting was fear.

- High workload, lack of familiarity with medications, high patient to nurse ratios and poor hand writing by doctor, were the most perceived common contributing factors of medication administration errors.
- Verbal communication by doctors and doctors' poor handwriting was a factor agreed by the vast majority of nurses in both demographic and professional groups. This may mean it is important to develop a clearer means of inter-professional communication or make changes to the system of medication administration in order to overcome communication issues.
- When asked which the most important "5 rights" were, it was surprising that only 16 (6.8%) nurses agreed that all rights of medications are important and they followed them. It had been anticipated that the majority would believe that all the rights were important. The most important right was perceived to be the "right patient" (77%). And the least important was "right time". This will be further explored in the next chapter.
- Comparison of the responses of perceived contributing factors of medication administration errors by different demographic groups highlighted potential cultural differences. This was particularly apparent in relation to pressure to complete medications quickly, lack of familiarity with medications, inadequate initial training and lack of supervision for inexperienced staff. However these were not consistent across all potential cultural influences eg nationality, language, country of qualification. This warrants further investigation and may have implications for training needs and system changes.
- The lack of familiarity with medication was recognized as a contributing factor to medication administration error and differed with nationality, which may indicate that nurses' knowledge and initial training may be different between nurses from different

nationalities. This may also necessitate and require individualised training based on individual needs of nurses depending on their level of training.

- Facilitators to reporting errors were duty, support and training for nurses who reported errors. This was consistent across all cultural and professional groups, however a small number of nurses suggested it was better to ignore errors in some circumstances which may be supported by the number of nurses who admitted that they had not reported errors.
- Finally there is clear under reporting of errors and there is clearly fear regarding error reporting. These factors which may potentially impact on error reporting (the perception of an error and the fear of reporting) will be explored further in the subsequent chapters

## **Chapter 5: Interview findings**

### **Introduction**

This chapter presents the second phase of the study, providing an in-depth understanding of the nurses' experience of managing medication administration errors in their practice. The aim of the interviews was to gather nurses' perceptions on reporting and managing errors. These results will be combined with data from the quantitative part of this study (chapter 4) in the discussion chapter to enable more comprehensive evidence and understanding of nurses' experience about medication errors. It is expected that results from this part of the study will contribute to establishing a safe and evidence-based nursing practice for medication administration in the health care settings investigated. It was apparent from the quantitative study (chapter 4) that nurses' experiences and perceptions of medication errors and their causes and contributing factors were associated with high workload, poor handwriting by doctors, unfamiliarity of medication administration, and lack of communication between doctors and nurses and between nurses from different countries. This phase of the study utilised the in-depth views of nurses in relation to five medicine administration error scenarios to attempt to explain how and why these factors and other related issues were related to the occurrence and management of medication errors. This chapter includes:

- Sample characteristics
- Findings-Coding and generating themes
- Conclusion

### **Sample characteristics**

Of the 56 nurses who provided their details on the reply slip from all groups showing their interest in face-to-face interviews, a total number of twenty nurses were selected from the three hospitals to be involved in interviews, with one Saudi female withdrawing leaving nineteen for analysis, of these ten males and nine females. The sample included thirteen Saudi nurses and six were from different origins (3 Indians and 3 Filipino); nine had obtained the Bachelor's degree in nursing with the rest holding a diploma; the age of these ten nurses ranged from 20-30 years, eight were 40 to 50 years old and one was over 50 years old. The nineteen nurses represented different departments with the majority (5) from the emergency



department. Eight of them had more than 5 years' experience and nine had 2-4 years with only two who had less than 2 years.

**Table 5.1: Qualitative sample characteristics**

<b>Characteristics</b>		<b>Frequency</b>	<b>Percent (%)</b>
<b>Nationality</b>	Saudi Arabian	13	68.4
	Filipino	3	15.7
	Indian	3	15.7
<b>Gender</b>	Male	10	52.6
	Female	9	47.4
<b>Age</b>			
	22-30	10	52.6
	31-40	0	0
	41-50	8	42.1
	51 <sup>+</sup>	1	5.2
<b>Qualification</b>	Diploma	10	52.6
	BSc	9	47.4
	Master;s	0	0
<b>Experience</b>	Less than 2 years	2	10.4
	2-4 years	9	47.4
	More than 5 years	8	42.1

## Findings

Five key themes emerged from the data analysis process. Key theme 1, 'Contributing factors of medication errors' was generated deductively based on Reason's Organisation Accident Model and the Yorkshire Contributory Factors Framework, which defines three contributing factors to error: active failure, local conditions and latent conditions. It was important to include these pre-determined sub-themes in the analysis to gain a clear perspective of the relevance of the two models to the data. Key themes 2-5, 'precautions to minimise errors', 'facilitators to reporting medication errors', 'barriers to reporting medication errors' and 'strategies to minimise medication errors', were generated inductively from the participants' experiences described in the interview data.

**Table 5.1: Themes and sub-themes after coding stage**

	Categories	Themes	Sub-themes
Deductive	1. <b>Contributing factors of medication errors</b>	Active failures	Neglect and careless ness
		Situational factors	Nurse characteristics
			Miscommunication (Poor handwriting)
		Local condition	Workload
			Shortage of staff
			Distraction and interruption
		Latent condition	Feature of working area
			Unclear policies
			Lack of knowledge and skills
Inductive	2. <b>Precautions for minimizing errors</b>	Rights of medication administration	
		Double-check for some medications	
	3. <b>Facilitator to reporting errors</b>	Patient safety and risk	
		System improvement	
		Supportive environment	
		Avoiding future error	
		Avoiding negative action	
		Preventing complication to the patient	
	4. <b>Barriers to reporting errors</b>	Fear	Fear of punishment
			Fear of losing job
			Fear of relatives' reaction
			Fear of legal action
		Culture	
		Confusion	
	5. <b>Strategies to minimize medication errors</b>	Education and training	
		Feedback system	
		Using barcode and dispensing technology	
		Safe Environment	
		Supervision new staff	

Quotes from the interviews are used to further illustrate the findings and to allow the reader to arbitrate for themselves something of the nature of the responses which formed the data. The participants identified in the quotes were anonymised using random letters, identifiable only to the researcher.

## **1. Contributing factors to medication errors**

### **Active failure**

#### ***Neglect and carelessness***

It was also perceived that experience was not the only factor of increasing medication errors as some nurses believed that these errors might increase even when nurses were experienced:

*“Oh...that is a difficult question, I think errors may be caused by experienced people, but this is not necessary...but the people who are more likely to make errors are those who are also careless...”AY\_F*

*“The similarities lie between medicines, wrong drug preparation,...like miscalculation, unclear order and careless staff” HN-M*

This demonstrates that the relationship between a number of different factors contributes to neglect and carelessness, as highlighted in human error theory (Reason, 1990).

### **Situational factors**

#### ***Nurse characteristics***

Nurses differed in their views regarding the age of the nurse as a positive or negative factor to increase or decrease medication errors. They related experience to age of the nurse and some believed that older nurses were likely to have more experience and less likely to make errors. One of the nurses said:

*“...Yes I think the older nurses are doing less error...because of their experience...” BG-M*

Less vision and activity as well as memory of old staffs were perceived by other nurses as a stage where nurses may lose some of their memory and vision which could lead to increased medication error:

*“...The elderly staff should not be treating some patients...old nurses have less vision and activity not like young staff...” AZ-M*

*“...The older memory and focus are not good...” RE-F*

Some nurses had other controversial points and believed that memory or concentration may be low even in young people and therefore age alone is unlikely to affect medication errors:

*“...Lack of concentration can be in any one old or young, age is not affecting if you are confident and concentrating...” SH-F*

### ***Miscommunication (poor handwriting)***

Several nurses considered some factors related to the active failures. Of these factors was the absence of a printed order system and unclear handwritten doctors' orders which was considered by seven nurses. As these nurses stated:

*“...if the order is new for you, you may misunderstand and have an error...” IN-F*

*“...Doctor writing on the medication sheet not clear...sometimes with more patients and lack of English language especially for new staff you cannot spend a long time analyzing what doctors write...” AF-F*

### **Local conditions**

Local conditions were perceived to impact on medication errors and fell in four main categories; workload, shortage of staff, supervision, and distraction and interruption.

#### ***Workload***

The workload was also considered, by nurses in the quantitative study, as important factor and was associated with nurse to patient's ratio. As these quotations demonstrate:

*“...Busy units are more likely to have errors because of workload and also units which use more complicated medications...” AZ-M*

*“...I would like to say that medication errors could be more common with less experience, high work overload, limited number of the staff, and unclear doctor hand writing...” AL-F*

#### ***Shortage of staff***

The lack of experience of staff was also considered, by nurses in the quantitative study, as an important factor and was associated with high incidence of medication errors and nurses were aware of that. Several nurses were concerned about this, for example:

*“...shortage of experienced staff is important and we have only a limited number of experts who are administering medications properly...” MR-M*

*“...the shortage of experienced staff is another thing to say...it is really a problem...” BR-M*

This is also noted by Lawton (2012) as an issue in relation to staff and staffing levels. The shortage of staff has increased the workload required from these nurses which might be a factor in the increasing errors.:

*“...Busy units are more likely to have errors because of workload and also units which use more complicated medications...high work overload, limited number of the staff...”*

*AZ\_M*

Nurses recommended increasing staff numbers as strategy to minimise medication errors, as one nurse stated:

*“...Should focus on environment...increase staff...qualified staff...”HM\_M.*

### ***Distraction and interruption***

Nurses considered that the distraction and interruption by visitors as well as other staff were important factors increasing errors by nurses administering medications. Nurses in the study agreed that their work area was busy, and crowded with patients and visitors which increased distraction and interruption for nurses. This was considered common in the study settings where the nurses work. As these nurses stated:

*“...Yes definitely it will affect...the environment if its crowded and busy with interruption and noise...the area of practice should be fit for practice...” FN-M*

*“...Some times we are not able to concentrate during the time of administration that’s also one of the factors...” PA-F*

Nurses were also concerned about the noise from outside the work area as well as the noise during visiting time:

*“...Yes sometimes, noise outside, visiting time may be at time of medication...” AL\_F*

*“...The environment is too busy, too noisy, too crowded and the area of medication preparation is not closed...if these things are sorted we will have fewer errors...” RE\_F*

## **Latent condition**

Latent conditions included three main themes; features of working area, unclear policies and procedures, and lack of knowledge and skills.

### ***Feature of working area***

Nurses believed that features of the working area, including space and lighting of the drug preparation room, as factors to influence medication errors. They mentioned that insufficient lighting sometimes limits the nurses' ability to read and space can limit nurses' ability to organise things. All these factors were considered as increasing the possibility for medication errors:

*“...factors like room size, lighting, spaces...” MA*

*“...Also the environment is too crowded and the area of medication preparation not closed or not well lighted so we cannot read things sometimes...” RE-F*

Nurses also mentioned the design and the way the room was designed for drug preparation as a factor. This seems that planning would help to organise nurses' work rather than how many meters they have in which to move. For example:

*“Another factor would be the way wards are designed to prepare medications for example the medication room...” AZ\_M*

Noise, as mentioned in the previous category, could also be defined as a latent condition factor, as it can be defined as a feature of the working area (Lawton, 2012).

### ***Unclear policies and procedures***

Nurses recognised that policies and procedures played a part in medication administration errors, but they had different views about them with some believing that they were standardised all over the world, or keeping up to date would help and others being unclear about the policies and instructions. As these quotations illustrate:

*“...Unclear understanding of procedures and instructions for medications...” BR-M*

*“...Yes, if you update and follow policies and procedures it will help...” MA-F*

*“...clear policy and guidance...” RI-M*

### ***Lack of knowledge and skills***

Nurses' knowledge and skills to match their nature of work was a factor influencing the extent to which nurses would make medication errors. When nurses were asked about which nurses are more likely to make a drug error than others, the majority considered the lack of knowledge and skills was a key issue and main cause of errors:

*"...For me yes, the new staff are making more errors because they don't have knowledge and skills..." FN-M*

*"New staff who didn't get proper education" BR-M*

However, nurses also considered experience and education as jointly important and they also talked about lack of knowledge and experience as key and important factors in increasing medication errors. For example;

*"...Depends on the experience less experience...less knowledge...less skills will cause the errors...." RE*

*"...the new staff usually and those who have less experience are more likely to make error" BR\_M*

## **2. Precautions for minimising errors**

Precautions for minimising errors were reflected in two main themes; rights of medication administration and double-checking for some medications.

### **Rights of medication administration**

Nurses considered all the five rights of medications as important rules for safe medication administration and precautions to minimise medication errors expanding on the information provided by the quantitative data. Experience of medication administration was the first issue concerning nurses as well as care when undertaking medication administration. They all stated that they followed and checked the doctor orders, right dosage, right patient, right time, and the patient's name before preparing medication. Nurses usually double-checked after

preparing the medication and documented their procedure on the patient's file. As one nurse said:

*“ Actually , we give medication using all the accepted routes we can use, orally, subcutaneous, IM, IV, when we give according to the five rights , we check and double-check the patient's name , be right about the medication, dosage, route also, time if the patient refuses we also have to know the patient's right...making sure that there are two of you looking at it, to see what you are giving is the correct medication...If the medication is not available in the pharmacy we know we should inform the colleagues and doctor” AZ-M.*

The five rights were all important, from nurses' perspectives. Nurses believed that the nurse should follow these orders as a means of avoiding any medication error. However, these rights were not the only thing nurses should do and they (nurses) believed that they do follow and care for patients starting from his/her admission to completing the care package and discharging the patient. For example:

*“...Following the doctor's orders since working in the general wards for example IPD... I have handled the patient from the beginning of the admission during the treatment until the discharge. We know the patient...we need to follow the doctor's order but during giving medication you need to remember the dosage, right patient, right dosage, right route, right time, frequency, documentation...and history of the patient, if there is any allergy you need to be guided...because of this care you will avoid any medication error but first thing you need to follow is the doctor's order...” IN\_F*

Nurses in the study reported that they were trained and able to give medications properly by all routes although this right of medication was not rated as most important to them:

*“We are all trained and have fair experience to give all medications by all routes, but I think we need refresher training and support from our hospital managers to sort our job and help to concentrate on medication and other procedures.” (AL\_F).*

### **Double-checking for some medications**

There were many views on the double-checking of IV medication on different wards and the majority of medications administered in the selected hospitals, were administered IV. In



addition to double-checking as part of rules and regulations, nurses also understood that intravenous medications might have to be checked even if the nurse was well trained, therefore, it was perceived important to double-check IV medication prior to its administration. As this nurse explained:

*“I believe some of the IV medications are dangerous, and should be checked by rules...it is not just reading a packet, and showing the correct medication and correct dose and preparing the correct volume...this is slightly stricter with the IV drugs, so for that reason we ask the people to double-check it” (BR\_M)*

The interviewees clearly expressed the view that the five rights have a crucial effect on their performance and play an essential part in administering medication safely. The majority of nurses believed that they have sufficient knowledge and experience to administer the medication safely:

*“ Yes, sure I am doing my medication according to time of medicines for each patient, usually before administering medication I have a look to the order and double check and check the 5 rights and administer medication carefully with good concentration, then the end stage is documented in the daily nursing notes in the patients file”  
(BR\_M).*

Nevertheless, when nurses were asked whether they could give medication independently, there were some situations in which they needed to double-check with other nurses. For example, rules in specific departments or specialities for checking or giving medications may influence nurses' need for assistance in medication administration. As this nurse described:

*“Before me giving the patient I have to check and double-check the five rights and after I have to check again” MM\_F.*

Similarly, nurses mentioned their familiarity with medications as means of minimising errors, especially those nurses who started their job very recently. Nurses believed that on the whole they did not need to ask other professionals (such as doctors, pharmacists, supervisors) for help, however, in some cases e.g. a new medicine, help would be sought. This could be from a supervisor, a text book or other senior staff. As these quotations illustrate:

*“...Almost all nurses can give them independently, if its new medicine, if its first time I think I need to ask and double-check with my supervisor about it, but next time no need...” HM\_M*

*“...sometimes we need help yeh... If any new medication that I am not familiar with before giving the medication I should ask the pharmacy. According their instructions I will give the medication...”MR\_M*

Although nurses mentioned before that they follow the rights of medication administration and they avoid errors, there were certain situations in which they asked for help, in particular when administering new medications. If assistance was not available, this could be one potential cause of making and underreporting medication errors.

### **3. Facilitators to reporting errors**

Facilitator to reporting errors were reflected in six main themes; patient safety and risk, system improvement, supportive environment, avoiding future errors, avoiding negative action and preventing complications to patient.

#### **Patient safety and risk**

Patient safety was one of the nurses' concerns which drove them to report their errors either to doctors or their managers. They also reported errors to comply with hospital regulations and avoided repeating these errors next time they prepared or gave medications. For example:

*“...I may report for the future because of patient safety...” MM\_F*

*“...To save the life of the patient, it's for patient safety and hospital regulations...” AL-F*

Nurses believed that they had to report errors regardless of any consequences and they admitted that they were not afraid to report errors. Further, nurses also believed that it was easier to manage their situation if the patient had any complications from errors:

*“...I do not have to be afraid because this is for patient safety...” RE\_F*

*“...Patient and his health is the first priority for our hospital...” BR\_M*

The responses to the “right/wrong dose” scenario suggested that nurses deal with incidents according to the risk behind that incident. For this type of error all the nurses were more keen to report the error whatever the outcome. The nurses were keen to inform doctors and in-

charge nurses and were not concerned about losing jobs or any type of punishment. They believed that they should report the error to save the patient's life without concern of what would happen to them if they concealed the problem and something happened to the patient, as represented in the following quotations:

*"It is really a stressful situation and I will feel nervous, because I gave double dosage which may kill the patient...I have to report it, yes to my supervisor and doctor as well...of course...because it is an overdose and you have to observe the patient...it is life or death...I am not concerned about the job...I will report it straight away...punishment or whatever but you have to make the patient safe and observe him whatever happens"* MA\_F

In the "right/wrong route" scenario, nurses stressed that as in the "right/wrong dose" error, they were all thinking about the patient's life and safety as well as the relatives' reaction and thinking about how to deal with family. They were also concerned about legal actions if the patient was at risk of death:

*"I think if the relatives knew about the incident the nurse should report it. I would report it and try to convince the relatives that it is better to manage it than to leave it so we can save the patient's life. But if the relative did not see the error, it may be better to leave it as this may cause a problem we do not need it, we may tell him or report after patient has been saved"*

AL\_F

The fifth and the last scenario was about delay of treatment ("right/wrong time"), which did not appear to be an issue for nurses as it is not a life threatening error. It seems that the degree to which nurses intended to report their errors depended on the risk of the error and to what extent the error is threatening the patient's life. A proportion of nurses believed that this error was not very risky and they felt that they did not need to report it:

*"Yes, it is but not serious...yes sure it has to be reported just for the patient rights. It's basic in nursing to document the incident and everything that happens"* HN\_M

*“Actually, it’s not too much of an error , but we have to take care next time as it is a delay...it may be an error but not harmful...I may report it for the future because of patient safety” MM\_F*

### **System improvement**

A large proportion of nurses felt that reporting errors to doctors or in-charge nurse along with assessing the patient’s condition properly were part of improving and providing an optimum level of service congruent with nurses’ job rules and values. They also believed that reporting errors would save the patient from harm and help avoid any legal action against nurses.

*“First, I don’t know what will happen with the patient, so I will inform the doctor, then inform the nursing supervisor. But if I feel it is not a problem and the patient is OK so I think not to do anything, it is not easy to do as the manager could report me and patient’s family will take me to the court even if their patient is OK. I am not going to lose my job for nothing. As I said we are following one program which is “Risk man” we have to enter all these incidents if the patient is at risk” BG\_M.*

Although nurses were concerned about the punitive environment in the “right patient” scenario, their responses on “Right/wrong medication” were quite different as they were all happy to report the error either to their in-charge nurse or doctor for different reasons; patient’s safety, patient’s rights, avoid error repetition, and importance of patient’s health. They believed that with reporting errors they would be able to do something for the patient and they would also be improving services in the future. Nurses were aware of their responsibility to report errors, and their accountability for the welfare of patients and risks of litigation, as the following quotations demonstrate:

*“The basic thing I should do is to watch the patient and report this error and notify the physician to assess and observe the patient as well...it is the right of the patient. The other thing is I have to make myself safe if anything happened later to the patient...I will have protected the patient if I reported the error as doctors may have time to do something for patient before the wrong medication takes action” FN\_M*

*I think I have to check both patients and see any reactions...I have to inform the doctor as well to see what I can do for these patients...will check vital signs as well...We usually check the correct patient and correct*

*medication...because in the future so as not to make the wrong decision again and bad experience myself...I also want to think about any legal actions so I have to be safe” SQ\_F*

Nurses also argued that reporting errors and avoiding these errors to happen in the future would encourage nurses to report their errors especially when they were assured that they would be safe if they did. Nurses also believed that this would help in improving their system through feedback that informs nurses of what and how an error happened, showing them how to deal with the situation in the future. As these nurses explained:

*“...If the managers look to improve the system and use errors to avoid future errors that would be an encouraging factor...” MM\_F*

*“...Should the staff have confidence in management to report their errors otherwise they will still hide their errors...” HN-M*

These nurses also believed that errors should be used by the institution to improve practice rather than for punishment. If this is the case the nurses would have no doubt or hesitation reporting errors:

*“...If the staff feel that their report of errors will not affect their job and them individually and it is just for improvement purposes, believe me, they will report every incident with no hesitation...” FN\_M*

*“...if reporting is for improvement and quality purposes that would be also encouraging...” SN\_M*

### **Supportive environment**

A supportive environment was mainly represented in focusing on errors and nurses believed that the supportive system should focus on the error to be resolved but not on the individual to be punished. Again, it is to support and train nurses on error management rather than punishing them which can lead them to hide errors. As these nurses stated:

*“...If the staff has a supportive environment and clear reporting system which focuses on error not the individual believe me they will report it...” BR-M*

*“...Understand how the error happened and solve as much as they can manage the causes of the errors for improvement rather than focusing on punishment only...” AZ-M*

### **Avoiding future errors**

There was also a view of institutional priorities and possible rules about managing errors, but nurses are still concerned about legal actions. One nurse mixed organisational priorities, legal action, and self-protection in one view, which may show that nurses were not following a system or guidelines on the process of reporting and managing errors if they happened:

*“...To avoid it in future and for improvement purposes...” AY\_F*

*“...Because in the future not to make the wrong mistake again...” SQ\_F*

Nurses also stated that they report errors because it is a patient's right. One nurse said:

*“... Yes sure it has to be reported for the patient's right...” HN\_M*

### **Avoiding Negative Action**

Adding to what nurses provided in the “system improvement” section, the other staff perceived an error as a source of trouble with the patient's relatives and family. Therefore, they preferred to report the error to be safe from the patient's family reaction which might involve them in legal action:

*“... To protect myself, if the system is good it will help the staff to report...” RI\_M*

*“...Patient's family will take me to the court even if their patient is OK. I am not going to lose my job for nothing...” BG\_M*

### **Preventing any complication to the patient**

Nurses also mixed care about the patient's health with worries about legal action which might indicate that nurses are not aware of standard rules in their institution. For example:

*“...Patient and his health is the first priority for our hospital...this is as well for legal action and to protect myself and patients from any complication...” BR-M*

*“To protect the patient from any complication” SN\_M*

*I would report it and try to convince the relatives that it is better to manage it than to leave patient so we can save his life. But if the relative did not see the error, it may better to leave it as this may cause a problem we do not need, we may tell him or report after patient has been saved”  
AL\_F*

The welfare of the patient and preventing any complication was one of the first priorities from some nurses responses.

#### **4. Barriers to reporting errors**

Although nurses, when responding to hypothetical scenarios, considered reporting errors as part of their job, some of them believed that they should report errors to avoid any consequences like punishment or family reactions. Nurses’ responses in the hypothetical scenarios and in real situations may indicate that nurses might report if they felt safe. This category presents the barriers as to why nurses may feel unsafe and hide their errors or even delay reporting them.

##### **Fear**

When nurses were asked about what factors might encourage or stop the nurses reporting medication errors, all nurses in the study considered fear as the key issue. Nurses argued that fear was related to punishment, losing job, relatives reaction, and legal action.

##### ***Fear of punishment***

Fear of punishment was argued as a main issue discouraging nurses to report errors and they were all keen to report if reporting was used to improve work rather than punishment itself. As these nurses stated:

*“...Fear from punishment and losing job...” AZ\_M*

*“...Afraid of punishment that is why I may not report...”* MA\_F

Nurses also added that it depends on the organisation they work for, and they perceived that if their organisation would use the error to punish the nurses then they were not reporting their error. One nurse said:

*“...If the organisation will take the error and use it for punishment then I am not sure because I am not sure if I can stay in my job or have unfair punishment...”* HN\_M

### **Fear of losing job**

Regarding the “wrong patient” scenario, all nurses are aware of the “system” of reporting errors and why it is important to report errors but most of them were concerned that this could make trouble with the patient’s family or legal actions. Therefore, they were not sure if they would report their errors and they were afraid of losing their job or the reaction of the patient’s family which might be more complicated. A number of nurses were specifically concerned with losing their jobs as a form of punishment:

*“I think I am not going to put myself in a situation which may end with losing my job, absolutely I will report it to my in-charge nurse, if there is any change that happened to this patient it will be a problem again. Even if nothing has happened I don’t know what is going to happen to the patient, so it is safer to report it”* AY\_F and AL\_F.

Another issue nurses were concerned about was that errors might affect their evaluation and consequently their salaries or termination of contract. Six nurses emphasised that they worried about their job termination if they had committed an error. They said:

*“...The main one is fear of punishment...some of the staff think this will affect their evaluation, salary and terminating their contract...”* MR-M

*“...Nurses may be afraid of punishment or afraid of the contract being terminated, afraid of the consequences that will happen to the patient, and some investigation...”*

IN\_F



### **Fear of relatives' reaction**

The fear of relatives' reactions was also considered a concern for nurses when thinking about reporting errors. They thought that patients' relatives would make complaints against nurses in the case of errors which again may affect their position, salary and jobs:

*"...Afraid of cut salary, afraid from manager...What else?...afraid of evaluation may be she gets an unsatisfactory evaluation...sometimes afraid of patient's complaint and patients' relatives..." SQ-F*

*"...On the other side I am sure the hospital would take any action against me like punishment or fine for example. The other thing would be patients' relatives they will harm me or take me to court, this is what makes me not sure whether to report or not..." AF\_F*

### **Fear of legal action**

Although encouraging nurses to report their errors was a role of managers, nurses believed that if their managers offered a safe environment rather than focusing on individuals when reporting errors this would encourage them to report any error with no hesitation. Nurses said that they would be happy to report these errors if they were guaranteed that it would save their job, evaluation and salaries. For example

*"...Fear of punishment or legal action like a cut in salary or termination of contract. If the staff could feel that their report of an error will not affect their job and them as individuals, and it is just for improvement purposes believe me they will report every incident with no hesitation..." FN-M*

The unsatisfactory evaluation of staff was recognised as the way to lose a job or even affect nurses' salaries. As one nurse said:

*"Afraid of cut in salary...afraid from manager...Afraid of evaluation may be she will get an unsatisfactory evaluation...sometimes afraid of patient complaining and patients' relatives...these are factors stopping me from reporting" SQ\_F*

## **Culture**

Culture was noticeably affecting nurses' decision to report errors as they considered making such an error would decrease their value and they would be victimised either by the surrounding society or other nurses in the institution:

*"... Culture as an error means to some people that they are killing patients and this may stop nurses from reporting errors even to save their lives..." BR\_M*

*"...Nurse might be ashamed and feel not valued if they made errors, culture..."*  
*AL\_F*

Some nurses might find themselves with an error and then considering their professional image when they report it. Some of them find it shame to be in guilty position. According to the interviews that feeling depend on the person social background and their initial original education.

## **Confusion**

Some nurses were unsure as to whether they should report errors. These nurses emphasised that focusing on the individual could have an impact on the nurses, pushing them to hide errors. The role of a punitive environment in inhibiting reporting errors cannot be over-emphasized, as fear of punishment represents significant disincentives to report these errors. One participant presumed that the "no blame" culture is linked to staff/patient safety in hospitals and consequently reporting errors. Three nurses who were not sure that they would report errors said:

*"It is a really confusing situation and I would not be sure if I would call my manager and doctor but I think it will be better if I did, but I am sure I will check the vital signs and observe the patient for any immediate complications.. On the other hand I am sure the hospital would take any action against me like*

*punishment or a fine for example. The other thing would be patients' relatives, they might harm me or take me to court, this is what makes me not sure to report or not...at the end of the day it is patient's safety and I may protect myself from more complicated situations as reporting and documenting might help to avoid more serious situations and may be much easier than having a legal action or punishment especially if patient died" AF\_F*

## **5. Strategies to minimise medication errors**

Nurses provided suggestions of factors which they believed would reduce medication errors. They agreed that education; feedback systems and using bar codes were the most important strategies to manage medication errors which might also be provided by the organisation.

### **Education and training**

Training and education were identified by nurses in this study as major drivers for the safe administration of medication. Several participants appeared mindful of how it was crucial for them to attend the necessary training to improve their skills and update their level of knowledge on medication administration. This attitude seemingly was related to their awareness of their responsibility to administer medications safely and determine their personal and professional development needs:

*"...In my opinion and from my experience staff who receive training and education will be influenced to give medication safely it will reduce the medications errors. Education will improve my skills and knowledge and as well will enhance my ability to give medication safely...RI\_M*

For some the level of qualification influenced the nurses' familiarity with medication, it was presumed that the nurse would appreciate education as a strategy to minimise errors. From the nurses' point of view, regular mandatory education would be influential and could improve the quality of care in terms of medication administration:

*“...When I am studying 2 years minimum experience, regular education has to be mandatory...” SH-F*

Nurses were asked about the extent to which their education and training could influence their ability to administer medications safely. They were also asked about any particular training to improve their practice in relation to medication administration. Nurses appreciated knowledge updates and continuous education and they suggested some topics they believed that were important such as intravenous therapy, dosage calculation and blood transfusions given as part of treatment. Some new nurses or older ones welcomed courses on basic drug therapy to reinforce their confidence to administer medication safely. As these nurses stated:

*“...We should update knowledge and join useful courses to be up to date to deliver medication safely and confidently...IV therapy and blood transfusions would be more necessary...” AY-F*

*“...Sure it will help specially the continuous education and focus on the basics of medication administration it will improve the staff...” HM-M*

Other topics were also recommended by nurses, these included communication and group discussions on important issues on to manage medication safely and nurses strongly agreed on providing courses on these topics. One nurse said:

*“...Group of discussion about medication administration so you will be concerned and know how to provide things about pharmaceutical drugs and drug interaction...” IN\_F*

Further, nurses also believed that nurses needed to know how to encourage reporting as well as using complicated forms of medications such as mixing drugs:

*“...It will be useful to have lectures about medication safety, storing medications, diluting medication, and drugs mixing and formulation...” AL\_F*

## **Feedback system**

Quality of care also included a feedback system within the hospital management plan to help nurses know what their errors were and how they could avoid it in the future. One female nurse argued:

*“...I would say that the feedback from the quality office...hospital management is helpful...” PA-F*

Some nurses admitted that they reported errors with no feedback and they thought that they would benefit if they had this feedback:

*“...I have reported it many times and no feedback...” RE-F*

One nurse also noted that one of the feedback systems which affect practice is the “Quality Bulletin Boards” which are in public view and show how staff addressed medication errors.

## **Using bar codes and dispensing technology**

Nurses in this study were asked about the views on how using strategies like bar codes or dispensing technology could reduce medication error. Nurses appreciated using technology like printed bar codes to facilitate preparing and managing medication:

*“...Technology has good impact to avoid unclear orders...and dosage will be clear...will provide patient identification and will save time as well...technology will make the medical process and procedures much faster and easier...” HN-M*

*“Bar code will definitely reduce errors because they have one code for each single medication and the nurse will not be confused between similar medication packs. This will also help and make it easy to get the order from the doctor. It will also save time,*

*maintain safety, make the order clear, avoid poor hand writing, give clear dosage, and clear route. AZ\_M*

Nurses also said that using bar codes could save time, make the process easy and help nurses choose the right medication without the need to read the label:

*“...I believe that this will help grasping the right medication and leave no chance for errors due to similarity of medication packs. Technology can minimize the errors and possibly save time for nurses to give medication properly...” AL\_F*

*“...Technology in general will make the process easier in the organization...and bar codes will help to assure that we and the pharmacist select the right medication for the right patient. It really makes the process more accurate and sure will minimize the errors number...” BR\_M*

However, a small number of female nurses disagreed with using bar codes and argued that the 5 rights would be sufficient if nurses used them to prepare and give medication. They said:

*“...No, I don't believe that...I believe everyone should be aware of the 5 rights and how to prepare the medication...you must check medication when you take it from the shelf...check the box...check before you prepare and during the preparation and before you give...when giving the medication it must be guided with those rights...” IN-F*

*“...I don't think so that barcodes can reduce medication errors...” AY-F*

### **Safe environment**

The previous sections showed that nurses believed that policies and procedures are important and helpful in minimising medication errors; nurses agreed that a supportive environment and authority will improve their skills, which may indicate their organisation's policy of managing medication errors. One nurse argued:

*“...Safe environment for staff to report their errors, increase training courses, increase the supervision for the new staff...” BR\_M*

A safe environment was also achieved through a variety of techniques which were also reported earlier such as using bar codes, training, and proper communication. As these nurses stated:

*“...Reporting system to provide safe environment, avoid the staff shortage, and focus on error itself for improvement not on punishment...” MM\_F*

*“...I hope give more training, classes, doctor understand nurses.” SQ\_F*

### **Supervision of new staff**

In addition to training, supervising new nurses was also recognised by nurses as crucial to managing errors and avoiding any consequences of medication errors if they happened:

*“...as we talked just now, good supervision, support staff, avoid shortage, feedback, who prepares the medicine should give. AL\_F*

*“...Safe environment for staff to report their errors and increase the supervision for the new staff BR*

It was also recognised by nurses that supervising nurses would decrease the number of errors happening:

*“...Yes of course the good supervision will reduce the number of errors”...RI\_M*

*“...yes we have to follow the hospital policies...supervisors should supervise the staff...” SH\_F*

## Summary of chapter

This chapter has described the qualitative findings in this study. The sample consisted of 19 nurses, 10 of them male, 9 females. The findings have added a new perspective on nurses' beliefs and perceptions of medication administration errors. Nurses provided views on factors related to the active failure, local conditions, and latent conditions. Active failure factors were perceived as contributing to medication administration errors, these included negligence and carelessness, situational factors such as nurse characteristics and poor handwriting. Local conditions factors included high workload, shortage of staff, interruption and distractions. Latent conditions factors included lack of training and unclear policies.

The majority of nurses were aware of the importance of the rights of medication administration and they followed these rights to avoid errors. Nevertheless, they agreed that errors might occur as a result of unfamiliarity with medications and they showed their readiness to seek help from other health professionals like doctors and pharmacists.

Nurses appreciated the need to report medication errors to either doctors or their managers because of patient rights and in order to improve patient safety. Some situations were more risky than others and this would make them more likely to report, for example if a patient's life was at risk. When faced with a series of hypothetical scenarios, it was clear that nurses weighed up risks when deciding to report the errors or not. The greater the risk to the patient, the more likely the nurses were to report the error, whereas when the risk to the patient was less they either did not see the need to report the error or they believed they should report because of the system. They strongly agreed that nurses have barriers to reporting these errors such as fear and culture. Fear included fear of punishment, fear of losing job, fear of relatives' reaction and fear of legal action. They were also afraid of the impact of reporting an error may have on their evaluation or the way their manager viewed them. Some were afraid of potential legal action or an adverse reaction from the patient or their relatives. Only one respondent was concerned about the impact an error might have on the patient themselves- this is in contrast to the answers the respondents gave when asking what would encourage them to report- when the majority were concerned about patient safety. Cultural factors will impact on nurses professional image and this leads to feeling shameful and will prevent nurses from reporting the errors.

When errors were not reported, nurses were concerned about what might happen to them if something happened to the patient because of the error. Nurses differed in their views about



reporting with some believing in reporting errors to improve services and others reporting these errors due to fear of punishment like losing their job. They were more likely to report errors if:

- The error was serious and the patient had a reaction which could not be hidden, so they could avoid any legal action
- The patient's life was threatened by error; nurses did not care about losing their job if a patient's life was in danger.

A few of the nurses said that they report errors complying with their system and to avoid future similar errors or to build and improve their error management guidelines. This was also confirmed and supported by nurses' responses to another item regarding barriers to report errors.

Nurses have suggested strategies to manage errors such as education and training on topics like communication skills, IV therapy and dose calculations. Nurses also believed that using the feedback system, bar codes, and dispensing technologies to help nurses know their errors and how they can avoid them in the future would help to encourage reporting errors.

Finally, this evidence will be validated through matching and triangulating these findings with the findings from the quantitative part of the study in the next chapter.

## **Chapter 6: Data triangulation and discussion**

### **Introduction**

The present study is original in its examination of the nurses' perceptions regarding medication administration errors within a culturally, complex Arabic context using a mixed methods design to integrate the data from different sources. Previous studies used either a quantitative or qualitative approach but none have used mixed methods within the Saudi context. The findings in the current study offer a comprehensive understanding of nurses' views and perceptions on medication administration errors within the Saudi context; this provides valuable evidence to help improve patient safety in Saudi Arabia. Knowing the values, beliefs and perceptions that nurses hold about safety in their workplaces should help management evaluate their safety culture programs, and predict the extent to which staff will participate in improving patient safety and quality of care through communicating errors (Leonard & Frankel, 2012). This knowledge can be built into professional education in managing medication administration for both Saudi and international nurses employed in Saudi Arabian hospitals.

The quantitative part of this study presented the results of a large sample of nurses' perceptions regarding medication errors. Although there are some acknowledged limitations, it highlighted an underreporting of errors and the nurses' role and awareness of precautions to minimise errors, barriers to reporting errors, and contributing factors influencing error incidence and strategies available to deal with these errors. As the nature of quantitative research lacks the ability to obtain in-depth data, a qualitative study was also undertaken to provide supportive and complementary evidence about nurses' views, and through the use of scenarios, information on how they may behave in certain error situations.

However, according to the assumption that triangulation of data from qualitative and quantitative sources helps to overcome bias, increase depth of understanding and confirm the completeness of evidence which increases the validity of findings (Murphy and Dingwall, 2003; Kinn and Curzio, 2005) and to make the evidence comprehensive by two sets of data, the quantitative and qualitative parts need to be nested and merged in an interpretative stage. This chapter presents a comparison and triangulation of these two sets of data drawing together the findings of the most common contributing factors, the barriers to reporting, and the strategies which could minimise the number of errors based on the participants'

perspectives then comparing and contrasting them with the evidence with the evidence from the systematic literature review. This will be the focus of the discussion.

The findings showed that there are a number of contributing factors which relate to active failures, particularly in the qualitative study such as carelessness and poor communication, local conditions such as distractions and interruptions, lastly latent conditions such as unclear policies and lack of training. These issues need to be managed with a more engaged nursing management who has knowledge of these processes. Findings show that 20% of nurses in this study have made at least one actual error whether it harmed or did not harm that patient in last 12 months with only 10% of them reporting their errors. This underreporting of errors may be due to many factors such as fear and worry of legal action or paying compensation for the error. Reporting barriers are such as fear, losing job, and no feedback. Nurses error reporting depends on the degree of risk, if it is serious they might report it, if they see it as not serious they may hide it.

### **Nurses experience of medication errors**

When nurses were asked in the survey about their experiences in terms of any incidence of any medication error, a total of 49 (20.7%) nurses had made at least one error either with or without potential harm whilst thirty three (14%) of them witnessed actual errors of which eleven nurses (4.7%) had made these errors within the “right patient” aspect of the rights of medication administration. In the pilot interviews with six nurses, two nurses had made an error which represents a third of participants; however it was believed that this direct questioning about the errors hampered the detail of remainder of the interview. Therefore, in the in-depth interviews, nurses were asked about how they would react in hypothetical scenarios regarding whether they would report the error or not. This provided more detail regarding how and when nurses would report errors, but at the expense of discovering whether nurses in the interviews had made actual errors and their actual reactions.

Obtaining information on actual numbers of errors is difficult, this could be because it is a sensitive topic area and people do not want to admit their errors, or it could be that different nurses have different perceptions of what constitutes an error. In the systematic review, there were various ways of measuring error, making the results difficult to compare.

In the second part of the questionnaire on perceptions of medication administration, nurses were asked to answer which one of the five rights is most important while they administer

medication. The majority of nurses responding to the questionnaire considered the “right patient” (77.1%) as the most important right for them with the “right time” being the least important for 73.3% of the approached nurses. There were less than 10% of nurses who said that dose, route and medication were important and none of them agreed that “right time” time was most important to them. However, despite all of this, nurses were not asked whether all the rights were important or not important which meant that the questionnaire was unable to provide this data. However, the researcher was able to explore this in the interviews. For the most part, it was clear in the nurses’ interviews that nurses agreed that all rights were important and appreciated the importance of patient safety. When one of the nurses believed that he was going to report an error even if losing his job, he said that the most important thing to him was to make the patient safe (MA-M). Another one said; “patient safety encourages me to report” (BG). Failure to follow the five rights of medication administration was one of the contributing factors mentioned by Hewitt (2010). The study by Jones (2010) stated that nurses rated 11 potential contributing factors to medication administration errors and nurses not following five rights were considered as one of the 11 factors.

The interview (hypothetical scenarios) and survey data indicated that nurses had an awareness of the need for medication error reporting, and the survey data suggested that despite this awareness, nurses underreported errors. Building on that, the researcher’s interpretation is that all rights were important to the nurses and following them all leads to increased patient’s safety. Nurses in the interviews said that they checked all these rights prior to medication administration and none of them highlighted that any of these rights was more important than another, but one nurse added the right documentation and history of patient’s health to the five rights indicating the importance of all rights. This may give an impression that nurses, even when they ticked the “most important” or “least important” option, they may have believed that all rights were important with one more important than the other. This was also clear when one of the nurses responded to the “wrong time” scenario which talked about the patient who was transferred to the X-ray department and returned to the ward three hours after the time of medication. The nurses said that the time was important for medication safety but they also said that it was not serious and would not threaten the patient’s life. The time issue was considered in a study by Unver (2012) which found other hospital procedures happening at the time medication was normally given to be a key factor of medication errors. Giving procedures at the right time sometimes becomes impossible, when the patient is not in their room for example. The study also addressed factors behind the

wrong time of administration such as location of the medication room, size of medication room, unreadable labels, and so on.

From all scenarios it was clear that nurses appreciated all the rights and believed that all are important for patient safety and using them are the nurses' professional responsibility and liability, however it is possible that some of the respondents believe that some rights are more important than others. This has drawn the attention of the researcher to the fact that nurses who responded on the questionnaire might also consider all rights important but when they were asked to choose, they have chosen the most important one as they see it, and this is a limitation of the methodology.

### **Contributing factors as a source of errors**

Discussing contributing factors helps to identify opportunities and raises awareness among clinicians of system failures that need to be fixed. The ability to openly discuss errors and adverse events internally is a necessity for open, honest disclosure with patients and their families (Leonard & Frankel, 2012).

The contributing factors of medication errors by nurses are classified according to the organisational accident model (Reason, 1997) and Yorkshire contributory factors framework (Lawton, 2012) at three levels: active failure, local conditions and latent conditions. The use of the two theoretical frameworks in this study has enabled the classification of contributing factors to medication errors in terms of active, local condition, situational factors and latent conditions levels. This has aided the analysis of the data in terms of enabling a clear improvement plan to be developed that can influence change and improvement.

A variety of factors contributing to medication errors were reported by nurses in the quantitative study with the most agreed or strongly agreed to contribute being a high workload (82.6%), lack of familiarity with medications (81.4%), high patient to nurse ratios (80%), poor handwriting by doctor (79.7%); and inadequate initial nurse training (79.6%). However, even those which were less agreed such as misunderstandings and drug similarity were rated by 63.6% of nurses which suggests that nurses believe all factors were likely to influence actual medication administration and increase medication errors.

### **Active failure and situational factors**

Unclear verbal instructions between doctors and nurses were another issue increasing the medication errors of nurses in the selected settings. Findings from the questionnaire showed unclear verbal instructions between doctors and nurses (76.2%). The nurses' responses in the interviews made it clear that they considered that even nurses from different countries who speak English still have difficulty to communicate with other nurses and patients from different countries especially when they use their local Arabic accent. Comparing the findings in the reviewed studies, there were similar findings by Kim (2011) and Murphy (2012) who also found that miscommunication through language was a factor for increasing medication errors.

Verbal communication was not the only factor associated with nurses' languages or accents. Poor handwriting was also mentioned by nurses in the interviews and considered a factor influencing nurses' medication administration. One nurse (MM-F) said that "sometimes the order from the doctor was not clear so you do not know what is the dosage or the route" for example. The nurses considered it as an important factor which may increase medication errors through misreading and misunderstanding. Nurses also supported the finding on the questionnaire and agreed that poor handwriting was an issue and complained that doctors' writing was sometimes unreadable especially for new staff and for those who have no English language skills. Nurses said that they did not have sufficient time to analyse what the doctors had written and they sometimes tried to guess what was on the order which also increases errors. A recent study by Abdar et al., (2014) also found that nurses were having difficulties to read the physician's order written in the patient's file.

This finding supported the findings of nearly half of the studies in the review which all agreed that difficult-to-read writing of doctors was a major concern for nurses all over the world which possibly increases medication administration errors worldwide (Karadeniz 2002; Mayo and Duncan, 2004; Tang et al., 2007; Ulanimo, 2007; Mrayyan, 2007; Armutlu 2008; Jones, 2010; Petrova, 2010; Murphy, 2012; Abdar et al., 2014). Petrova (2010) found that doctors' poor handwriting was part of poor communication not only for nurses but also for all the health team and they suggested using technology such as electronic or printed prescriptions to minimise the risk of errors.

When talking about minimising errors that arise from miscommunication, it was presumed that people differ with their ability to speak or understand their or others' languages within a

multicultural organisation. In this study, it was clear from nurses' words that changing systems or organisations is not an easy job, rather it is easier to focus on individuals instead. This would give nurses the responsibility for the incidence and the management of medication errors, which has been shown to be ineffective in other health care systems (Lawton, 2012). The latter reported using organisational change as an effective strategy to manage factors that enhance proper medication administration.

With regard to the human error theory, Armitage (2009) reported that human performance was stratified by Rasmussen and Jensen (1974) into three levels: skill-based, rule-based and knowledge based. Norman (1988) analysed concepts like human tasks, heuristics as cognitive shortcuts, and error types, ultimately segregated slips, lapses and mistakes as all active failures with the first two being skill-based errors with the third being errors of planning. In line with this, in the interviews in the present study, nurses mentioned a number of skill-based contributing factors to active failure including carelessness, negligence and lack of concentration.

### **Local conditions**

Some of factors related to local conditions were mentioned by nurses during the quantitative study, such as high workload, shortage of staff, interruptions and distraction. The majority of these factors were also mentioned by nurses during the interviews for example: heavy workload, busy units and noise as local conditions which may also distract and/or interrupt nurses while administering medications. All these factors were also reported in the study by Ulanimo (2007) who found that busy units and unit routines were part of the local conditions perceived as factors inhibiting nurses to report their errors to their managers or the institution.

Heavy workload was clearly supported by the evidence in the vast majority of the reviewed studies (19 out of 28 studies). For example Tang and colleagues (2007) supported this finding and found that nurses were spending time to solve other problems while administering medications which created a heavy workload within the allotted time. This was especially valid for new nurses or those who were transferred from other wards. Other examples supporting this finding were the studies of Kim (2011) and Murphy (2012), both referred to the workload as an advanced process of drug preparation and administration which also pushed nurses to give medications without rechecking and consequently increasing their errors. Shortage of staff nurses and fatigue due to heavy workloads were also reported in the study by Abdar and colleagues (2014). In items of factors relating to nurses, the most

common factors determined by nurses were “lack of staff to patient ratio and nurses’ fatigue from hard work (Alyosif, 2013). In a study which used a critical incident technique, 2344 medication administration events were observed in a children’s hospital and errors were reported in 36.5% of them (Ozkan, Kocaman et al., 2011). The types of errors were mainly late administration of medication caused by workload and interruptions (Ozkan, Kocaman et al., 2011).

Nurses also considered the distraction and interruption by visitors as well as other staff as another important factor increasing errors by nurses when administering medications. Nurses in the qualitative study agreed that their work area was crowded with patients and visitors which also increased distraction and made interruptions for nurses. There appears to be a need for the public to know when and who to ask rather than keep asking the nurse during her/his medication administration. This is supported by Unver’s (2012) study which found the two highest perceived factors of medication errors were nurse exhaustion and nurse distraction. The nurse administering medications was usually supposed to be labelled “please do not disturb” (Raban, 2013). Interruptions in the medication process, and heavy workload were also factors that emerged from a study by Murphy (2012).

Armitage (2009) suggested that slips may be common in busy environments with high workload and essentially errors occurred in the human automation process where there is no conscious control and the individuals normal routine is disturbed with heavy workload and possibly fatigue. Heavy workload was perceived by nurses in the questionnaire as the most common factor of medication errors (82.6%). Workload may increase with shortage of staff, which then increases the higher number of patients per staff member and increases the tasks for the nurse who gives medications, consequently pushing nurses to solve other issues whilst administering medications. Increasing the number of patients and tasks was also rated by nurses in the questionnaire as a common factor (high patients to nurse ratio) making errors more possible. Heavy workload in the questionnaire was also associated with “the pressure to complete medications quickly”. Questions regarding workload were not directly posed in the interviews but nurses, when talking about workload, were concerned that the workload was really distressing them with an increasing the number of patients and number of orders meaning they are under pressure to finish their work on time. “...Busy units are more likely to have errors because of workload and also units which use more complicated medications...” AZ-M



The other local condition that was found to influence medication safety during medication administration was the lack of supervision for inexperienced nurses. The questionnaire results showed that supervision was one of the major factors with conditions that may increase medication errors and this was also confirmed by nurses during the interviews: (RI-M) stated that “good supervision will reduce the number of errors”. This was accompanied by nurses’ view that they would not ask for help unless they had doubts about the medication otherwise they worked independently or sometimes they returned to textbooks or asked their direct supervisors for information about medication.

Again, organisational system change and improvement is needed to deal with errors, however, Reason (2009) also believed that managers cannot change the human condition to minimise future errors, rather it was found that it is easier to change the conditions under which humans work. For example, they might offer extra leave days to provide rest or increase numbers of staff to deal with high workload issues.

### **Latent conditions**

Reason (1997) stated that errors associated with organisational processes rather than human nature and errors cannot be minimised or prevented by changing individual behaviours or conditions. In this setting, knowledge is defined as an organisational responsibility, i.e. nurses should be provided with adequate training to equip them for their role (Evans, 2009).

The lack of familiarity with medications was a concern of 81.4% of nurses in the survey study and similar findings supported this finding in the qualitative study, suggesting that their knowledge of medications was inadequate. For example, one of nurses in the study said that he/she would ask the pharmacist about medication and its effects. Some nurses were happy to ask doctors, senior staff and go back to read books if necessary if or when they had time.

With regard to nurses’ training, some nurses were satisfied with their initial training and supervision but 79.6% said that they did not have adequate training in their present hospital. They believed that regular training should be mandatory. They also agreed that training and education are always accompanied with fewer errors. In the interviews the majority of nurses suggested that training programs especially for inexperienced staff would have a good impact in terms of minimising the number of errors. Respondents suggested that training courses such as IV therapy, drug calculation and drug preparations would be highly useful to increase

their knowledge and skills, which would enable them to administer the medications safely and limit the incidence of medication error. This is supported by Reason (2009), who proposed that error management has two components: limiting the incidence of dangerous errors by individuals rather than responding and managing errors which have already occurred. Both of these components can be integrated within training approaches to improve the reporting of medication errors.

Continuing with the contributing factors was the lack of knowledge of newly qualified nurses which was stated by 76.7% of the questionnaire respondents. This was also found in the interviews when nurses said that new staff made more errors due to lack of knowledge and experience. They also continued to say that knowledge and skills are “twins”, meaning that the two go hand-in-hand, i.e. knowledge is developed through education, training and the development of new practical skills through experience, for instance, new staff may have sufficient knowledge but these staff still would not have sufficient experience as they would need time to build their experience. Nurses in the reviewed studies were also concerned about the lack of experience of new staff and considered that new inexperienced nurses were likely to make errors (Murphy, 2012). Kim (2011), Jones (2010), and Bohomol (2007) also found that new staff lacked skills which were a factor of increased medication errors which provides a further support for the findings of the current study regarding the lack of skills and experience of newly qualified nurses. Armitage and Knapman (2003) state that collaborative research is essential to inform future policies and procedures for drug administration and errors and the introduction of drug administration into the university nursing curricula.

The similarity of the appearance of drugs was considered by nurses as another factor in increasing medication errors. Participants in the questionnaire stated “drugs with similar appearance or names” (74.6%) was one of the contributing factors for example, Propofol and Etomidate (Look like) and Phenylephrine and epinephrine (Sound like). This finding was also confirmed by nurses in the interviews who also said that similarity of drugs’ names increased the occurrence of errors. This finding was also found in the supportive evidence (Bohomol, 2007; Kim, 2011). Hewitt (2010) and Keers (2013) also confirmed the confusion between drugs with similar names, similar packaging, and confusion regarding infusion devices as factors increasing medication errors. According to Lawton (2012), these were considered as external latent conditions.

Furthermore, nurses in the interviews were also aware that their organisation's rules, regulations, and policies are also important conditions and factors that may influence their role in medication administration. They believed that policies and procedures are important and helpful in minimising medication errors. They agreed that a supportive environment and authority will improve their skills, which may indicate their organisation's policy of managing and reporting medication errors. The importance of clear policy and procedures in the organisation was also recommended by the study of Ulanimo (2007) who found that an organisation may have barriers to reporting errors and they included: lack of clear policies and procedures to report errors.

### **Error reporting**

There were eight statements in the questionnaire that nurses were asked to rate regarding reporting their errors; four items represented barriers and four represented facilitators and factors that encourage error reporting. The top three agreed statements were: nurses have the duty to report, own reporting should get support and training, and sanctions should be proportionate. However, there were other statements that were also important and there was only a marginal difference in nurses' responses between these statements and the top three statements. Therefore these statements were also considered in the survey. These statements were "others do not report because fear of punishment", "different professional views of errors result in no reporting", "different cultural views of errors result in no reporting", "not reported error due to fear of punishment", and "better to ignore errors in some circumstances".

However, this part of the chapter discusses nurses' responses on the items regarding error reporting whatever the item was, because regardless of the severity of the error, there is always some risk to the patient, be it a small risk to their safety or a threat to their life. Within the qualitative interviews, nurses were exposed to different scenarios representing the five rights of medication administration to see what barriers or facilitators that may influence reporting medication errors and what they would do if they had made an error and their responses were presented according to their scenarios. Again, these responses were merged and used accordingly to support nurses' responses on the questionnaire.

It was clear in a retrospective study by Armitage (2009) that some studies in his report showed that different policies and documents considered that error reporting may be a factor in improving patient safety. The author provided evidence on the structure, process and

culture of reporting in that reporting should have a theoretical base to state the central principle of error theory. Further, the study implies that the guidance and support for nurses may help them identify a more accurate causation and learning from other experiences. The latter also stated that any action taken should primarily focus on protective measures and preventing the incidence of error and consequently inform practitioners what they are supposed to report. That was clear in some nurses' responses in the interviews. They mentioned that if the management focused on error and analysed it to improve the practice of all staff rather than focusing on the individual, they would be more likely to report their mistakes.

## **Barriers**

There were a variety of studies in the review which showed that groups of nurses believed that reporting errors is crucial but none of them reported clearly how many nurses had actually made errors. The findings on reporting medication errors in the current study, which are unique to Saudi Arabia, was that 20% of nurses in this study have made at least one actual error whether it harms or does not harm with only 10% of them having reported their errors. This might also show the underreporting of errors in Saudi Arabia which may indicate that nurses were still hesitant to report these errors and ultimately drive senior management personnel to think about more strategies to fit in this culture and help nurses report their errors. Nurses in the current study volunteered and discussed various reasons and barriers to error reporting such as fear of punishment and other professionals' views on reporting errors.

For the statement "others do not report because fear of punishment", half of nurses agreed or strongly agreed that the fear of punishment was a barrier to report errors. This was really clear in the nurses' responses in the interviews when some believed that they might be punished or blamed by their culture which may be another important factor to consider. That fear of punishment or losing a job was clear when nurses were concerned about patients' families and said that they would not report the error if they had felt that a patient was not at risk. When one of the nurses (BR\_M) said that patient's health was a priority for his hospital, he followed this by saying that he "wanted to protect himself". Fear was an issue reported in other studies and across a range of cultures, including Toruner (2012) (Turkey), Kim et al (2011) (South Korea), Mrayyan (2007) (Jordan), and Al-Youssif et al., (2013) (Saudi Arabia). The latter study provided evidence from a descriptive survey which was analysed by a factor analysis which demonstrated that 4 factors relating to fear were the most

significant barriers to reporting evidence. In a health system where nurses are not insured for negligence, this is an even more prominent fear for nurses who will have to cover the financial penalty for any mistake they make.

Additional cultural concerns were about the family's reaction which represented both individual and environmental cultures for nurses; this was clear in the interview with BG\_M who said that the "patient's family may take me to the court". Another nurse (SN\_M) also admitted that "he will be in trouble with the patient's family if (he) reported the error". The least common barrier in the quantitative survey and addressed by nearly 44 nurses (20%) was "not reported error due to fear of punishment". Although this barrier was not recognised by nurses in the quantitative study as common, it was a major concern in the qualitative study and was repeatedly mentioned throughout the interviews. For example, one of the nurses in the qualitative study admitted that the hospital would take an action against her as punishment or possibly a fine (AF-F). This nurse also considered reporting as much more likely in more serious situations such as legal action if a patient died, for example. Similarly, another nurse was concerned about losing her job and believed that even "if nothing had happened now; it could happen in the future and might end with losing my job" (AY-F). Another 3 nurses preferred to report only if anything happened to the patient but admitted that would be more complicated and they would be in trouble with the manager and the family (BR-M, PA-F, SN-M). Further, it was also assumed by some nurses that they would be punished anyway especially if the patient had any complications like anaphylactic shock, so they could have their job terminated or their salary cut (IN-F, MR-M, FN-M, SQ-F, AY-F, BR-M).

Regarding the evidence from the review, this part may be, to some extent, overlapped with the statement "others do not report because fear of punishment" which was discussed previously at the beginning of this section. The studies by Kim and colleagues (2011), Mrayyan (2007), Ulanimo (2007) and Al-Youssif and colleagues (2013) supported this finding when talking about punishments and legal actions in addition to Petrova (2010) who also found the fear of blame as a barrier to reporting errors. Even with other professionals like doctors, it was clear that punishment was a factor inhibiting reporting errors. In a study by Lawton (2002) it was reported that doctors were also concerned about reporting and were afraid of litigation although they have their own professional standards and regulations which protect them and defend them in all situations including medication errors.

Regarding the barrier “different professional views of errors result in no reporting”, it was agreed by nearly half of nurses in the quantitative study. This was supported by nurses’ responses in the interviews. When AF-F said “It is a really confusing situation and I would not be sure if I would call my manager and doctor but I think it will be better if I did”. Another nurse (MM\_F) said “it’s not too much of an error, but we have to take care next time as its delay might be an error but not harmful”. The literature suggests that other professionals were also hesitant to report or hide the error due to socio-cultural features. For example, Waring (2002) found that fear of blame was a barrier to reporting errors by doctors due to the perception of doctors about their professional culture in terms of self-regulation, occupational hierarchy, external image of medicine, and clinical autonomy. Moreover, in the latter it was perceived that errors became a feature of the medical profession and have been normalised and discounted as problematic issues that require reporting. However, nurses are more susceptible to blame than other professional groups, especially from their colleagues (Armitage, 2009).

Another half of nurses in the quantitative study agreed about the statement “different cultural views of errors result in no reporting”. To some extent, this statement might overlap with the statement above as nurses may feel that errors may be a taboo in the sense they may feel shame or guilt, or that their reputation may be affected at work. The interviews did not explicitly look at cultural differences; it was too small a sample size and would have been intrusive. An ethnographic study may have had the potential to do this or an interview study that focussed on culture itself rather than culture in relation to a sensitive topic such as medication errors, however these approaches would also have potential problems regarding intrusion. Issues regarding culture were highlighted in the reviewed studies showing culture was of great influence on reporting medication errors and referred to individual, group values, and attitudes (Wakefield, 2001; Sanghera et al., 2007). Locally in Saudi Arabia, the study by Al-Youssif and colleagues (2013) found that nationality had influenced reporting errors. The result from the questionnaire shows controversial responses regarding cultural views of errors, for example different professional views of errors result in no reporting and different cultural views of errors result in no reporting. It was hoped that the data from the interviews would give more depth as to what these cultural issues were, but this was not clarified, most likely due to the sensitivity of the topic and a lack of focus on this area. This is a priority for further research, to enable a full understanding of the impact of cultural issues on medication error reporting. It was argued by Reason (2009) that individual blame is also

likely to be less expensive than dealing with systems. It was also argued that it is easier to blame an individual but much harder to change individual behaviour. This was clear in nurses' interviews when nurses said that the management usually focus on blaming and punishing individuals rather than solving the problems through changing systems or behaviours. According to Leonard and Frankel (2012) it is difficult for staff to talk about mistakes when they are trained in a culture that suggests that skilled, capable practitioners do not make mistakes if they try hard and take care. Measures that facilitate, support and encourage nurses to report their medication errors are more effective. For example one nurse stated that: "...If the staff feel that their report of error will not affect their job and them individually and it is just for improvement purposes, believe me they will report every incident with no hesitation..." FN\_M

### **Facilitators**

There were four statements representing facilitators and encouraging reasons for reporting errors that were agreed with by nurses in the quantitative study; nurses have a duty to report; nurses who report their own errors should be supported with additional training; sanctions should be proportionate; and it is better to ignore errors in some circumstances.

The item "nurses have a duty to report" was the first statement agreed with by the vast majority of nurses in the quantitative study (91.5%). For example, one of the nurses believed that it was for the patient's safety which is the aim and core of nurses' job and hospital regulations (AL-F). Another nurse said it was an ethical issue to report an error, which is also part of professional rules and regulations (SN-M). This was mentioned in the study of Jones and Treiber (2010) who found that nurses often recounted how the mistake was made and their responsibility to report it as soon as possible. However, this belief in having a duty to report, contrasts with the low response of only 23 (9.7%) of them saying that they had reported errors that they had made. Nurses' duty to report was part of their hospital regulations and that was clear in nurses' responses in the interviews that they valued this sense of duty to report error. It is interesting that nurses believed in reporting error but did not do it in the real setting. It is possible that this may be due to fear of punishment, as discussed above.

In addition to this was the statement “nurses who report their own errors should be supported with additional training” which was also rated by 90.2% of nurses as a means of minimising errors. This also adds to the consistency of data between the quantitative and qualitative studies. Nurses in the interviews confirmed this and addressed that they needed additional refreshing training and support from their management to help them concentrate on their work (AL-F). It was also recognised that regular and mandatory training should be provided for nurses even they have experience (SH-F). Other nurses also agreed that education was important to help nurses deliver their medication safely and improve their skills (MA-F, AL-F). The study by Kim (2011) supported this and found that lack of knowledge and training about medication errors has contributed to medication errors. Many of participants in the interviews emphasised the importance of medication knowledge and skills as well as the lack of knowledge and skills as contributing factors to medication administrations errors. Many nurses in Saudi Arabia are only educated to diploma level and all nurses regardless of qualification are able to administer medication. This is different to nurses from different countries who should have BSc degrees to administer medication and suggests that nurses will have varying levels of knowledge and expertise as a result.

The third facilitator agreed with by nurses was “sanctions should be proportionate” which was agreed by 74.6% of nurses in the questionnaire. This vast majority of nurses who felt that they lacked the authority to make decisions and might not be able to communicate with other professionals like doctors or pharmacists or even with nurses from different levels. Similarly, nurses in the interviews also said that they miss the communication with and are not supported by their higher authority. The nurse (HN-M) said regarding this point “If I feel the organisation will deal with error and sort problems logically and professionally I would be glad to report, but if the organisation will take the error and use it for punishment...” In the study by Petrova (2010) participants said that a good administration system will encourage reporting errors.

Effective leaders must also address the behaviours that create unacceptable risk, such as disruptive or disrespectful behaviour, and send a very clear message that these behaviours will not be tolerated. The real test of leadership and organisational culture comes when someone does act in this way. It is really not a question of ‘if, but rather when’ this will occur. Leaders need to know that their response will be watched widely and closely, and will send a very powerful message within the organisation about its culture. If leaders are



consistent in holding people accountable for unacceptable behaviours that create risk, they will have laid the foundation for a strong safety culture (Leonard & Frankel, 2012).

Nurses' views on whether it is "better to ignore errors in some circumstances" was also clear and more than 70% agreed on this item as helping to avoid certain reactions. From the researcher's perspective, this might be the main reason of the small figures of those nurses who reported errors throughout the research; nurses preferred not to be punished and had no need to report when their patients were safe. These reactions were well explained in the qualitative interviews where nurses believed that if the patient is not harmed then it was not necessary to report the error and draw the attention of the family towards any aggressive reaction against nurses. This was also clear when one of the nurses (BG-M) said; "...But if I feel it is not a problem and the patient is OK so I think I will not do anything, it is not easy to do as the manager could report me and patient's family will take me to the court even if their patient is OK...I am not going to lose my job for nothing". When compared to nurses' views in the previous studies it was clearly and highly consistent with those findings of Unver (2012) and Mayo (2004) in which half the nurses were also not sure if they would report some (not risky) errors because they believed that patients were safe and were afraid of the nurse supervisors' reactions. This argument may indeed give a clue that there are some errors (not harmful) that were still hidden by nurses either in the reviewed studies or in this current study.

Incident reporting (Vincent et al., 2013) is an indicator that is widely used in other industries to monitor safety performance. It was clear that feedback and reporting errors was important and being used in other disciplines to maximise safety and build a strong incidental reporting culture focusing on number, type, severity and location of incidents toward developing a more sophisticated process to assess the quality of reporting and managing errors.

Until the IOM report which was released (2000) there has been a trend in the healthcare system to assume that all errors involve individual incompetence, and that retraining and monitoring are the keys to improvement. This assumption of incompetence, and therefore blameworthiness, is problematic because it mitigates against the success of any incident reporting system designed to identify priority areas for improving patient safety (Parker & Lawton, 2003).

In the United Kingdom the National Patient Safety Association (NPSA) has tried to encourage an open and fair culture in hospitals, health staff to report incidents without fear of personal reprimand. Evidence from other industries shows that, while focusing on the individual at the sharp end offers a relatively easy and psychologically satisfying option, much is to be gained from a more thorough and penetrating investigation (Parker & Lawton, 2003). It is likely that should the same support exist in Saudi Arabia, nurses would be more comfortable with reporting medication errors. At the moment, fear of punishment prevents them from doing this.

These results can be shown in a diagram (Figure 6.1) which outlines the event of the error, the barriers and facilitators to error reporting and the consequences of these actions. This clearly highlights the issues which need to be addressed in practice to encourage nurses to report error.

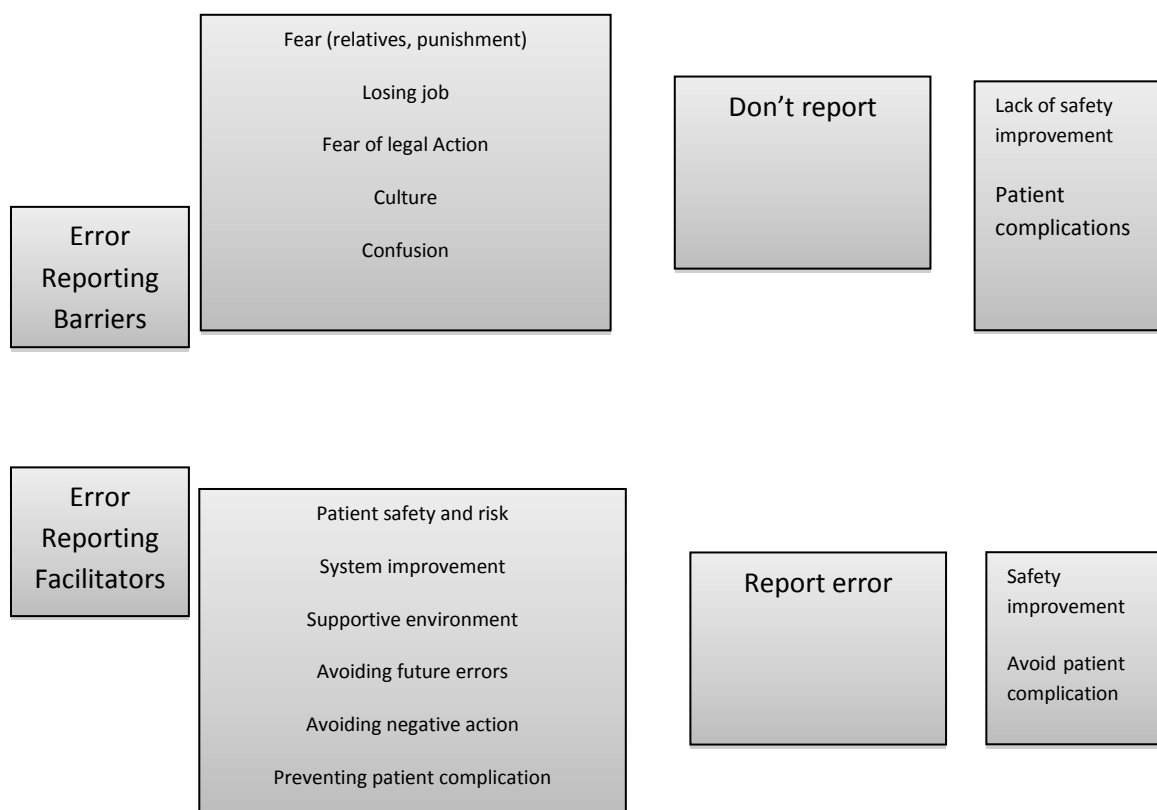


Figure 6.1 Nurses error reporting in Saudi Arabia

## **Strategies to minimise medication errors**

Nurses agreed on all items of “strategies to minimise errors” with the top three being: report errors whether harm occurs or not (91.1%), managers should monitor errors (88.5%), and hospital procedures should be effective for patient safety (86%). Reporting errors whether harm occurs or not conflicts with the findings that nurses felt it was okay to ignore some errors if they were unlikely to harm the patient. These strategies focus on changing and preparing an environment rather than human behaviour to help nurses either avoid or minimise errors. This was also considered by Reason (2009) who believed that managers cannot change the human condition; it is easier to change the conditions under which humans work. This is not new; indeed, in the last decades it was also found that organisations with a positive safety culture considered that shared perceptions of the importance of safety are characterised by confidence in the efficacy of preventative measures through trustful communications (Leonard & Frankel, 2012). It is worth here discussing all strategies for their importance as well as the small differences in nurses’ responses on these items in the questionnaire.

Reporting errors was also considered as a strategy to minimise recurrence of these errors with the most important statement on strategy, from the nurses’ perspective, was “reporting errors whether harm occurs or not”, this was agreed by more than 91.1% of nurses. In the interview, one of nurses (MM\_F) said “it’s not too much of an error, but we have to take care next time as its delay might be an error but not harmful”. As stated by Caplan (1991), the degree of harm relates to the risk of blame, which may influence whether the error is reported or not reported. Regarding the statement about hospital procedures being effective for patient safety, this could reflect the technologies used by the organisation to encourage nurses to report and then minimise errors, one of which was the feedback system as mentioned earlier. An important feature of the manager’s role agreed by nurses in the current study was monitoring errors, which was also mentioned by nurses in the reviewed studies as following through on disciplinary actions when nurses repeat errors (Ulanimo et al., 2007). Feedback within the organisation’s clear guidelines was also embedded within the findings of reviewed studies as a problem-solving strategy to minimise errors (Wakefield, 2001; Covell, 2009).

Nurses in the interviews also provided further information regarding the need for a supportive system and the need to provide feedback. This could increase patient’s safety, however, if the

feedback system is not activated, it may discourage nurses to report errors which may consequently affect the patient's safety negatively. Here the role of the manager could be emphasised, as some nurses in the interview said that they had reported the error many times but with no feedback (RE-F). The study by Murphy (2012) also supported this finding and said that 69% of nurses reported errors but only 11% received feedback. So 58% would feel that reporting errors was not an issue when feedback was not received and ultimately would stop reporting.

With regard to the strategy "managers should monitor errors", this was agreed by the majority of nurses in the quantitative study as well as in the qualitative study when nurses said that "good supervision will reduce the number of errors" It was also consistent with what was found in the reviewed studies. The study by Murphy and Alison (2012) supported this finding and showed the importance of monitoring errors and also showed the importance of the feedback system in the role of managers to monitor and supervise medication administration process and errors. This study found that health settings lacked monitoring and supervision through the absence of a feedback system for nurses who report errors which was supposed to be a cornerstone of supervision. Additionally, a study by Kim (2011) also supported these findings and showed that nurses thought that the three most effective strategies for preventing medication errors would be continuous monitoring of adherence to the 5 Rights of medication administration (62.5%).

The other procedure that might be applied by hospitals to minimize errors, would be using bar codes and dispensing technology which was also recommended as a means that is not only accurate but also saves time for nurses. Although nurses in the Ha'il region did not have access to this technology or systems, nurses in the interviews could see the benefits that this technology could help nurses avoid any duplication of drugs, avoid misunderstanding of unclear orders, and match the patient's name with his/her medication accurately. Nurses in the reviewed studies were also aware that bar codes and dispensing technology can minimize drug errors and increase patients' safety and they also believed that medication errors would increase if these strategies were not in use (Tang et al., 2007). The IOM (2006) recommends technological interventions for the prevention of medication errors in hospital care, specifically CPOE with decision support systems.

The strategies were mentioned above by the respondents were in line with Leape (1994) who suggested five specific mechanisms including relying on technology rather than human

memory to improve information access, standardisation, and staff training, to collectively design out errors. These strategies can work as proactive through identifying the latent failures within organisations that represent the preconditions for errors, and addressing these before a serious event occurs, or reactively through learning from (reacting to) previous incidents to minimise error in the future (Lawton, 2012). A variety of frameworks and assessment surveys have been developed and used in the UK and worldwide to understand what sort of safety culture an organisation has to minimise and manage their medication errors. Although these frameworks were valuable, they may not be applicable in a culture like Saudi Arabia which may need review and modification of tools to measure the safety in medication administration to suit the Saudi culture. Although nursing is an independent profession with its own regulations, it may also use other industries and disciplines' experiences to improve nurses' practice, particularly in managing errors and safety, described by Vincent and colleagues (2013) as organisational learning.

Another important issue to raise here is that nurses are not insured against medication errors although insurance is available for doctors (MOH, 2002). For the patient, who may be harmed, the policy states that compensation should be given to patients depending on the type and degree of damage, for example, organ damage, and partial disability. Parker & Lawton, 2003 stated a numbers of solutions could be effective to improve the quality of care and prevent some mistakes as the following, training and rigorous checking procedures, good quality guidelines, effective implementation, and the provision of necessary resources.

It is important here to draw the attention that some countries have already achieved significant advances in developing their national policy and regulations that may assist other countries to apply or even modify according to their situations. It is logical for other countries finding themselves in similar contexts to take advantage of these advances and save time and efforts in creating their country-specific policy, protocol and regulations for the improvement of health care (WHO, 2014). Differences in culture, for example the patient safety system, in Saudi Arabia mean that the policies of other countries such as the UK and USA may not work in this context. To overcome this in Saudi Arabia, policies and standards in Saudi Arabia might be updated to be applied in broader contexts and work as international guidelines. This ensures that the policies meet both local and international quality standards and suit the multicultural context of the country.

## **Strengths and limitations**

This study utilised a mixed-methods approach, with the aim of triangulating qualitative and quantitative data to provide an in-depth understanding of the perception of nurses regarding medication error contributing factors, reporting of errors in three hospitals in Saudi Arabia. It is a unique study addressing an area of limited knowledge in the Saudi Arabian context. The limitations of using mixed methods are that it is time-consuming and require multiple-researcher skills. The extent to which the quantitative and qualitative findings confirmed each other was limited by the collection of data from two populations which were not necessarily related (i.e. the interview data could not be linked to a specific survey response). Rather, the two methodological approaches generated two sets of data which complimented each other and contributed to a holistic understanding of the reporting of medication errors. Alternatively the questions of the interview could have been the same questions as the survey with opportunities to probe these questions to get more depth to triangulate the two approaches with the same data at the end. However, this approach was attempted at first with limited responses, hence the need to change and add the hypothetical scenarios. The sample recruited in the quantitative study should have been large enough to generalise the findings within the Saudi Arabian context, although the response rate was relatively low and included a high proportion of female nurses compared to males, which was not representative of the population. The findings are not generalisable beyond this context for this reason and also due to the health insurance system, in which nurses are not covered by their employer for negligence or mistakes. In the UK and other Westernised countries, nurses are insured against error and therefore would not have the same fears about reporting their mistakes.

It must be noted that there were inherent weaknesses in the questionnaire design. As there were no existing validated questionnaires that would meet the objectives of the study available, a new questionnaire had to be created based on the existing literature. Although the questionnaire was tested before use, a number of issues became apparent during data analysis which could have improved data collection. For example, the questionnaire was lengthy in order to cover all of the objectives, and some items were very similar. One example of these items was item 4 in the demographic data asked about country and gave options as regions; Europe, Asia, and Australia. Another example was the item about years since qualifications in which the respondent of 2 years' experience would be confused between option 2 or 3. This meant that participants may not have understood the questions correctly, or may have given different answers in response to questions asking the same thing. Whilst a small pilot

study was conducted and an expert panel was consulted, a larger pilot study, incorporating cognitive interviewing (Willis, 2005) may enable better identification of such structural issues, thus improving the quality of the data collected. The pilot study sought to test the questionnaire and Content validity was undertaken to ensure the adequacy of items and validate the tool. The CVI consists of two domains. The representativeness domain (R-CVI) which identifies to which extent the item is representative of a scale within an instrument, and the clarity domain (C-CVI) which identifies the clarity of the item to the reader. A larger pilot may have highlighted further weaknesses in the questionnaire. If I were to conduct this study again, I would undertake more testing of the questionnaire, I would use ranked lists so that I could identify which are the most important contributory factors and I would seek to ensure that the questions themselves are not ambiguous or potentially confusing to respondents.

The qualitative study aimed to add more in-depth data to the survey results, to further understand the phenomenon. An initial interview schedule was developed based on the study objectives, and tested in a pilot study. This indicated that the depth of information required would not be obtained using this approach and therefore the schedule was amended to include five hypothetical scenarios to stimulate discussion. Using scenarios is a method that is used to understand the perceptions, opinions beliefs and attitudes from the responses or comments to stories depicted in the scenarios (Finch, 1987), but it has not been used anywhere to uncover nurses' perceptions on medication administration errors. These were successful in generating in-depth data in the interviews; however some of the participants appeared more willing to disclose information on medication errors than others. For example, some females from Saudi Arabia were more hesitant in their responses, possibly due to the cultural relationship between males and females, and the researcher being male. It seemed that they wanted to finish the interview quickly and they may not have disclosed the truth through fear of judgment. In hindsight, the quality of the data could have been improved by employing a female researcher to conduct these interviews to make the participants feel at ease, although this would bring its own limitations if two different researchers conducted the interviews, as they may have asked the questions in different ways or used different prompts. Another limitation of using scenarios is that they led the nurses to think about scenarios in relation to what the researcher defined as important, rather than their own experiences without influence.

Because I pre-defined the themes that I was looking for in the data, there was little opportunity for participants' views that did not fit into my pre-defined categories to emerge

and therefore the level of my interpretation was limited and this limits the confirmability of the findings.

The analysis of the quantitative data in SPSS was rigorous, with regards to ensuring validity through checking for bias and Cronbach alpha reliability test. The qualitative data analysis combined a deductive and inductive approach. Using a deductive approach limited an original interpretation of the data; however this was necessary to explore the direct relationship between the participants' perceptions and the models underpinning the theoretical framework (Reason, 1997). In hindsight, the use of a framework analysis approach would have given improved structure to the data analysis sequence and would have matched the researcher's objectives, as it allows for the generation of inductive and deductive codes to facilitate policy development (Carr, 1994).

Qualitative research is subjective by nature, as it represents in this case, one researcher's interpretation of the subject under study. This is also the nature by which the subject is understood in-depth; however it is important to acknowledge the influence of the researcher on the data collection and analysis processes (Carr, 1994). The researcher is a male nurse by background and the head of a training department in the Health Directorate, Ministry of Health, Saudi Arabia. His interest in this topic area was the introduction of the topic of medication administration errors as a training need. It is important to recognise that his background in nursing may have influenced him to be sympathetic towards the nurses' experiences, although his current role in terms of developing training to improve care would have brought a different perspective to balance this. It is important to acknowledge that his interpretation of the data occurred within this background knowledge and may have been different had he not had this prior experience of working in the field of study.

I planned to draw some themes deductively and some inductively from the interview data. It was important to explore nurses' perceptions in relation to the theoretical frameworks, the Yorkshire contributory factors framework developed by Lawton et al., (2012) and Reason's organisational accident model (1997), so the first theme 'Contributing factors of medication errors' contained the pre-defined categories of active failure, local conditions and latent conditions. In the following four themes, the categories emerged inductively, however I do realise now that the themes were pre-determined in relation to my interview questions. As I was aiming for the qualitative data to confirm the quantitative findings, I matched the



interview questions and responses to the questionnaire to make sure that the qualitative data reflected the questions asked in the survey, and therefore confirm or not confirm the findings. In hindsight I realise that this did not constitute the best qualitative research approach. I understand that because I pre-defined the themes that I was looking for in the data, there was little opportunity for participants' views that did not fit into my pre-defined categories to emerge and therefore the level of my interpretation was limited and this limits the confirmability of the findings. If I were to conduct the qualitative phase again, I would use a more unstructured approach, asking participants generally about their experiences and perceptions of medication error. I would still use the scenarios as they were an important tool to stimulate discussion around this sensitive issue. I would use a framework analysis (Richie & Spencer, 2009) approach to analyse the data thematically, which would allow me to pre-define some themes and categories in relation to the theoretical frameworks and scenarios, but also to generate new themes inductively which were unrelated to the survey questions. This would ensure that the qualitative data represented the participants' perceptions rather than my own views, and would enable the qualitative data to truly confirm, or not, the results of the survey.

To reduce bias, a number of measures were applied in the qualitative phase to ensure rigour, including trustworthiness (confirmability, transferability, credibility). For example to which the research results can be applied in other settings or groups as part of the trustworthiness of the research or to the extent to which research results accurately represented the participants' points of view in study phases. I understand that because I pre-defined the themes that I was looking for in the data, there was little opportunity for participants' views that did not fit into my pre-defined categories to emerge and therefore the level of my interpretation was limited and this limits the confirmability of the findings

The use of the two theoretical frameworks in this study (Reason, 1997; Lawton, 2012) has enabled the classification of contributing factors to medication errors in terms of active failure, local conditions and latent conditions. This has aided the analysis of the data in terms of enabling a clear improvement plan to be developed that can influence change and improvement. The findings of this study have confirmed that the two models are suitable for explaining error causation and error defence in support of previous studies (Lawton, 2012; Armitage, 2009).

## Summary

In conclusion, this study shows that nurses follow the five rights of medication administration as a precaution in order to minimise medication error, however some of these rights are viewed as less important than others and this may impact on their views about reporting. This study demonstrates that there are a number of contributing factors to medication administration errors when classified according to the Reason model and the Yorkshire contributory factors framework by Lawton, (2012) as active failures, local conditions and latent conditions. Although there was an underreporting of errors, nurses emphasised the importance of reporting errors in improving patient safety and health care services. They were fearful of reporting errors due to fear of punishment and repercussions from the patients' relatives or losing their job. However, when a patient's life was at risk, their fear of punishment was outweighed by their duty to the patient and they would report the error. Finally, supportive education, training and feedback systems would encourage the nurses to report and would also minimise errors. Furthermore, nurses were supportive of introducing technology such as bar-codes and COPE as a means of minimising medication errors. As this result of this study shows there were some similarities with the literature review.

It's impossible to avoid all the errors and to change the human condition; it is easier to change the conditions under which humans work. According to Reason's model (1997) the contributory factors are linked to each other. For example in latent conditions, a management decision to cease the employment of a number of staff may lead to inappropriate local conditions such as high workload for the remaining staff. As a result, slips may be common in busy environments with high workload (Armitage, 2009).

As mentioned before, once errors were found as consequences not causes, focusing on individual responsibility for errors is likely to be ineffective as an incident reduction strategy. Further, nurses do not have the insurance against errors in Saudi Arabia; therefore, the organisation should not depend completely on an individual's memory or appropriate systems in place. Rather, an improved information access strategy with approved frameworks and tools in order to standardise and measure the service and let nurses report errors whatever the degree of harm followed.

The findings of this study provide a comprehensive understanding of the views and experience in the Saudi context. This provides valuable evidence that can be built into professional education and development in order to manage medication administration errors

and to decrease MEs for both Saudi and expatriate nurses from different cultural backgrounds working in Saudi hospitals. The majority of participants considered that the culture and the background from where nurses came did not any impact in terms of committing an error, although the questionnaire data suggested that there may be differences in perceived levels of training and the way different nationalities handle error management. This study used the mixed method approach but few of the previous studies have used this approach, they used either a quantitative or qualitative approach but none use mixed methods within the Saudi context.

## **Chapter 7: Conclusion and Recommendations**

### **Introduction**

Patient safety, particularly safe medication administration and the prevention of medication errors by nurses is the focus of this thesis. Nurses are the first line of defence for patients and as they have a role in administering medication, nurses have an important role in catching and managing errors at the patient care interface. The context for this study was Saudi Arabia, where the nursing workforce is both international and multicultural with differing levels of education and a system where nurses are not insured against medication error and any compensation to patients following harm from a nurse's error would be paid by themselves.

Given these factors it is possible that the perceptions and beliefs of nurses working in Saudi Arabia regarding medication administration errors may be very different to nurses working in other parts of the world.

Understanding these beliefs is likely to be the key to improving error reporting systems and ultimately the safety of the patients within the Saudi Healthcare system.

Using a mixed methods approach, underpinned by Reason's (1997) and Lawton's (2012) theories, this study aimed to investigate nurses' perceptions of medication administration errors in hospitals in the Ha'il region of Saudi Arabia. Four main objectives were considered to achieve the aim of this study:

1. To explore nurses' experience of medication administration errors in Saudi Arabia
2. To explore nurses' perceptions on their professional role and responsibility to report and manage medication administration errors.
3. To explore nurses' views about the factors that may influence medication administration errors in hospitals.
4. To examine nurses' perceptions on strategies to promote safe medication administration

The study has generated an evidence base of the perceptions of nurses working in Saudi Arabia around medication administration. This will inform the development of an appropriate safety culture within Saudi Arabian hospitals as well as appropriate nursing education that consequently may assist these nurses to report and manage errors across hospitals in Saudi Arabia.

This chapter highlights the main findings which emerged from the study, showing the implications of these findings for clinical practice and nursing research with a number of recommendations concerned with nursing practice and nursing research have been provided, considering the contribution of administrators who appear to be unable to manipulate the plans of nursing care. The results of this study have implications for individual staff nurses, nurse administrators, as well as the hospital administration and hospital systems in terms of medication error reduction and patient safety. It should be possible to minimise those factors by following a number of proposed solutions as mentioned below.

No study found in the review examined all the issues proposed in the objectives of this study, which means that this study is comprehensive in addressing a gap in the literature.

### **Nurse's experiences of medication administration errors**

Most nurses understand what constitutes a medication error when they defined the error and the five rights in both their responses to the survey and the interviews. The quantitative study suggested that 20% of nurses had made at least one actual error in the last 12 months.

The participants demonstrate the importance of precaution through hypothetical scenarios by emphasising the five rights followed and double checking before any medication administration.

### **Role and responsibility to report and barriers**

As noted above, 20% of nurses revealed that they had had made at least one actual error 12 months, however only 10% of them reported their errors which suggests there is underreporting of errors. This research shows that nurses are more likely to report errors if reporting the error will benefit the patient in any way. The key causes of the underreporting of errors emerged as fear. Nurses feared, losing their jobs or legal action. A lack of feedback when they did report errors discouraged nurses from reporting errors importantly, the

hypothetical scenarios demonstrated that some nurses' error reporting depended on the degree of risk to the patient. For example if an error was perceived to have a serious risk to the patient they were more likely to report it (regardless of the consequences) than if the error was perceived as resulting in a low risk to the patient. Another barrier to reporting was the management focusing on the individual error rather than the wider implications of the error itself. The factors which encourage nurses to report their errors are patient rights and patient safety.

### **Contributing factors to medication administration errors**

The findings showed that there are a number of contributing factors such as poor communication (including poor handwriting), nurses characteristics eg lack of concentration and low vision and carelessness. Local conditions such as high workload, staff shortage, distractions and interruptions are perceived to contribute to errors. Lastly latent conditions which contribute to errors include unclear policies and lack of training. These issues need to be managed with a more engaged nursing management team who has knowledge of these processes.

### **Strategies for safe medication administration**

Nurses in the two phases of this study stated a number of strategies they think has the possibility to reduce medication errors. Technology solutions were one of the first priority for nurses such as computer Physician order Entry (CPOE) and dispensing technology. Training and education in medication safety, medication preparation and dose calculation perceived by nurses as vital strategies to overcome this issue. Some of nurses asked to have mandatory and continuous on the job training. Nurses would prefer to have a feedback system in their work to motivate them report their error rather than report it with no feedback. Finally good supervision was perceived as one of the possible strategies to decrease error and enhance patient safety.

## **Contributions to knowledge**

This study has made a contribution to knowledge in the following ways: It has:

1. Generated evidence and offer a comprehensive understanding of the views from a multicultural group of nurses on their perceptions regarding medication errors in Saudi Arabia. This is a different context to that already in the literature.
2. Been the first mixed methods study of nurses perceptions regarding medication administrations errors in Saudi Arabia, and indeed the Middle East
3. Demonstrated the value of using hypothetical scenarios around the 5 rights of medication administration as a sensitive method of obtaining nurses' views regarding errors and error reporting
4. Demonstrated that despite the multicultural nature of the sample, and the different nursing context in Saudi Arabia, nurses in Saudi Arabia have similar perceptions regarding medication administration errors to nurses in other parts of the world, e.g. in relation to under reporting, fear of reporting , importance of five rights and precaution, contributing factors and strategies that could minimise errors.
5. Found that when nurses are trying to decide whether to report an error or not, they make a decision based on the degree of harm to the patient. The more potentially serious the harm to the patient – the more likely nurses will report, despite their fear of the consequences.
6. Will enable the creation of appropriate medication safety education and procedures for staff because it's based on the views and beliefs of those working in Saudi Arabia.

## **Strengths and limitations of the study**

This study utilised a mixed-methods approach, with qualitative data complementing the quantitative data to provide an in-depth understanding of the reporting of medication and administration errors in three hospitals in Saudi Arabia. It is a unique study addressing an area of limited knowledge in a multicultural Arabic context. The limitations of using mixed methods are that it is time-consuming and requires multiple-researcher skills. The sample recruited in the quantitative study was large enough to generalise the findings within the Saudi Arabian context, although there was a high proportion of female nurses recruited compared to males. The findings are not generalisable beyond this context due to the health insurance system, in which nurses are not covered by their employer for negligence. In the

UK and other Westernised countries, nurses are insured against error and therefore would not have the same fears about reporting their mistakes.

As there were no existing validated questionnaires that would meet all the objectives of the study available, a new questionnaire had to be created based on the existing literature. Although the questionnaire was tested before use, a number of issues became apparent during data analysis which may have improved data collection and the strength of the findings. For example, the questionnaire was lengthy in order to cover all of the objectives, and some items were very similar and some of the wording and categorising of the questions may have caused confusion. Asking respondents to rank the contributory factors and the strategies for safe medication administration would have strengthened the findings in this area. Additional validation of the questionnaire and further piloting may have prevented these issues occurring and increased the robustness of the results.

The qualitative study aimed to add more in-depth data to the survey results, to further understand the phenomenon. Five hypothetical scenarios were used successfully to stimulate discussion about how and when nurses would report errors, however this did not overcome issues of a male reporter interviewing females and they may also have led the nurses to think about scenarios in relation to what the researcher defined as important, rather than their own experiences without influence. As the questions in the interview were different to those posed in the questionnaire the interview results provided complementary evidence rather than confirming the questionnaire results.

The analysis of the quantitative data in SPSS was rigorous, with regards to ensuring validity through checking for bias and Cronbach alpha reliability test. The qualitative data analysis combined a deductive and inductive approach. In hindsight, the use of a framework analysis approach would have given an improved structure to the data analysis sequence and would have matched the researcher's objectives.

Qualitative research is subjective by nature, as it represents in this case, one researcher's interpretation of the subject under study. The researcher's background and position may have influenced him to be sympathetic towards the nurses' experiences, although his current role in terms of developing training to improve care would have brought a different perspective to balance this. It is important to acknowledge his interpretation of the data occurred within this background knowledge and may have been different had he not had this prior experience of working in the field of study.



To reduce bias, a number of measures were applied in the qualitative phase to ensure rigour. The use of the two theoretical frameworks enabled the classification of contributing factors to medication errors at different levels. This aided the analysis of the data in terms of enabling a clear improvement plan to be developed that can influence change and improvement. The findings of this study have confirmed that the two models are suitable for explaining error causation and error defence, in support of previous studies (Lawton, 2012; Armitage, 2009).

## **Recommendations**

### **Recommendations for practice**

In line with Reason's Organisational Accident model (1997) and Lawton's (2012) Yorkshire Factors model, this study found that nurses perceived there were multiple factors of medication administration errors, and these can be classified as active failures, local conditions, situational factors and latent conditions. The recommendations for practice draw on the findings in these areas and put forward suggestions to improve safety at these different levels.

### **Active failures and situational factors**

In Saudi hospitals all nurses can administer medication without specialised training or qualifications; as long as they are nurses they can administer medication. This will potentially lead to medication administration errors. Based on the findings of this study and interpreting these in relation to the literature reviewed, there are a number of recommendations for staff training about medication administration. Results of this study have serious implications for individual staff nurses, nurse administrators, as well as hospital administration and hospital systems in terms of medication error reduction and patient safety. Prevention of error involves open communication and collaboration of many disciplines such as physicians, nurses, pharmacists, patients, and those in administrative positions within the acute care setting.

There are two main strategies to reduce medical error: reactive and proactive. The first relies on learning from (reacting to) previous incidents to minimise error in the future while the second is concerned with prospectively Identifying the latent failures within organisations that represent the preconditions for errors, and addressing these before a serious event occurs (Lawton, 2012). All these strategies need to be activated (i.e. improve education and improve

the environment) to provide a safe environment in terms of administering medication safely at the sharp-end stage.

In order to not completely depend on memory, alternative options such as technology can be used to avoid slips and lapses, as stated by Reason (1997). Good communication channels should be activated to avoid mistakes, for example, computerised prescription should apply instead of hand writing which may lead to misunderstanding. Verbal orders should be avoided and all orders should be documented on the patient file to ensure patient safety in the procedure. Double checking by another nurse can overcome slips and lapses and emphasis the accuracy of the medication process

### **Local conditions**

There must be a cultural shift away from blame and shame to a culture of safety and there is a demand for a supportive environment with the focus on errors rather than the individual nurse this can be established by the leaders of the organization to provide a safe environment to report with no hesitate and they will treated with respect when they report. This could be achieved in training and in routine communication through memos and department meetings and effective supervision of medication administration. Interruptions and distractions by patients, visitors, other nurses or medical staff are some of the local conditions contributing factors. Distractions can be minimised through the use of special signs (that inform others that the nurse is not to be interrupted), and through public service announcements to prevent visitors causing interruptions.

From the findings of the study, heavy workload is considered to be the most contributing factor to medication administration errors. The heavy workload is due to shortage of nurses and increased number of patients admitted to the hospitals. In order to overcome this factor, the nursing authority in Saudi Arabia needs to increase the number of staff to meet the nurse/patient ratio according to the international standards as mentioned in the WHO.

### **Latent conditions**

In Line with Reason's organisational accident model the system factors play a big role in terms of patient safety improvement and reduce the number of medication error. The system factor could be a policy, decision or technology. Based on the findings of the current study, the following recommendations are proposed to be taken in consideration:

- The majority of nurses perceived that medication technology such as bar codes for medication administration; computerised physician order entry, automated and dispensing, decreased medication errors and increased safety for hospitalised patients. The study found that poor handwriting and unclear verbal instruction is causing medication administration errors, strategies suggested to overcome this include technology such as barcodes and CPOE to minimise these errors.
- The higher authorities should base the training needs on the number and content of incident reports, as this report will be reliable and informative, based on the quality improvement indicators. This kind of training plan will make it easier for the training department to focus on most issues that have arisen in the hospital settings. The higher authority in the Saudi Ministry of Health should start implementing the training qualification for medication administration as this training has very important elements and those nurses authorised to administer medication will be based on the qualification and training that they received. It is strongly recommended to start this kind of qualification as soon as possible.
- For existing staff training should be comprehensive and consist of drug calculation, drug preparation and administration, Intravenous therapy and precautions for medication administration. Workshops about giving medication and providing staff with hands-on training will help them to improve their skills. Aspect of training can contribute to the reduction of individual level factors such as slips, lapses and mistakes. It is crucial that management develops a strategy to identify and manage medication errors that suits the beliefs in this country.
- For new nurses there should be an induction or orientation programme. This should include training about hospital regulations and rules regarding patient safety especially medication administration policies.
- This study has indicated that the insurance system in Saudi Arabia underpins nurses' fear of reporting medication error, as they are not insured against any mistake they may make. This needs to change to ensure nurses have the same insurance as the doctor insurance to protect against their errors. Nurses need to feel supported by their employer and to be able to confidently report medication error without fear of being financially liable for the costs of their mistakes. The ministry needs to adopt the experience of one of the good ranking countries in health services with needed modification to suit Saudi cultural context.

## **Recommendations for research**

Based on the findings of the current study, the following recommendations are offered for further research:

- The researcher was unable to explore issues regarding culture in the qualitative interviews as this would have been intrusive. A study about different cultural beliefs regarding nursing care in Saudi Arabia would be valuable to enable better understanding of a variety of nursing practices. A study focusing on cultural issues more generally would be less intrusive – but could also provide valuable information that would also be relevant to medication administration errors. It would be useful to have a mix of male and female researchers to optimise data collection from female nurses who may prefer to be interviewed by a female,
- Male nurses' views were not well represented in the quantitative study. It is therefore important that any further work aims to recruit a more balanced sample to ensure that male nurses' views are represented.
- To identify the extent to which contributing factors to medication error reporting actually cause harm to patients. This could be done by analysing incident reports and following the patient's journey after the reporting of error.
- Distractions and interruptions are issues raised by this study. Future research should focus on observational studies to watch the medication administration process at the area of practice. This will allow for better understanding of how the nurse interacts with technology, patients, and the process, and identify types of interruption which may cause medication errors and strategies in order to decrease errors which happen during medication preparation and administration.
- Evaluate the impact of medication administration technology on preventable harm in hospitalised patients. This study demonstrated that nurses have a positive attitude toward the use of technology within the medication administration process.

## **Dissemination Plan**

The study findings will be disseminated by sending copies of the study findings to all participating hospital managements in the Ha'il region. Seminars will be organised at the participating hospitals to provide an overview of the main findings of the study to the nursing staff, heads of department and quality offices. The results of the study will be disseminated to the local scientific committees concerned with patient safety in Saudi Arabia. The thesis will

be available on the University of Salford repository. The systematic review and the study findings will be published in the professionally peer reviewed national and international journals in nursing which focus on patient safety and medications safety.

## **Summary**

This study offers a comprehensive understanding of the views and perceptions of nurses regarding medication errors within the Saudi context. This provides valuable evidence that can be built into professional education in managing medication administration towards decreasing MEs for both Saudi and international nurses employed in Saudi Arabian hospitals.

The present study is original in its comprehensive examination of nurses' perceptions regarding medication administration errors within a culturally unique, complex Arabic context using the mixed method research design to integrate the data from different sources. Previous studies have used single approaches and do not consider all the active, local conditions and latent failures that can either contribute to the errors or be used to reduce the errors within the Saudi context.

The main findings of this study are that in line with the international literature there are a range of factors that contribute to errors, however in Saudi Arabia the highest perceived factors were high workload and poor handwriting. There is an underreporting of errors and the fear of the consequences remains the most significant barrier against reporting medication errors, but nurses weigh up the risk to the patient before deciding whether to report it or not. However the majority of nurses agreed that increased and continuous updated knowledge would help to lessen medication errors. Training was recommended as one of the most important strategies to minimise the number of errors. Use of scenarios in this study has opened up the debate about whether or not to report errors and how to avoid making them. It is hoped that the evidence produced in this study will offer an evidence base to assist in the development of nursing education, thus reducing the number of medication errors and increasing best quality practice throughout Saudi Arabia.

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# APPENDICIES

## Appendix (1): Example of Search History

- 1 exp medication errors/ or exp medication reconciliation/
- 2 "drug use error\*".mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]
- 3 medication error\*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]
- 4 medication administration error\*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]
- 5 1 or 2 or 3 or 4
- 6 nurs\*.mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]
- 7 5 and 6

## Appendix (2): Data collection instrument- English



College of Health & Social Care  
Frederick Road Campus  
Salford  
M6 9PU

### **Research Study: Nurse perceptions of medication errors**

Dear participant,

Thank you for agreeing to complete this questionnaire. This form should be accompanied by a Participation Information Sheet and an envelope for confidential return of your completed questionnaire should you choose to participate. If you choose not to participate, please put all of the documentation into the envelope and place in any Internal Hospital Mail drop.

Before proceeding to answer the questions, please complete the first section. This is very important because it provides a confidential statement of your consent. If you complete the questionnaire but do not tick the two boxes the researcher cannot be sure that you understand what is being asked of you and that you give your consent to participation and your data will not be used to inform the study.

The questionnaire should take between 10 and 15 minutes to complete. For your own privacy you may wish to complete it away from your work area.

Thank you.

---

### **SECTION 1 – Information and anonymous consent** *(Please place a tick in both boxes before proceeding ☑)*

1. I confirm that I have read the Participant Information Sheet relating to this research project and I believe I have sufficient information to make an informed decision ☐
  2. I confirm that I am participating in this research project willingly ☐
-

**SECTION 2 – Information about your background, and qualifications – but not about your name or place of work location**

In this section, please *circle* the correct answer

- |   | MALE                              | FEMALE                        |                       |          |
|---|-----------------------------------|-------------------------------|-----------------------|----------|
| 1. Are you  |                                   |                               |                       |          |
| 2. What is your age?  | 18-21                             | 22-30                         | 31-40                 | 41-50    |
| 50+   |                                   |                               |                       |          |
| 3. How many years have you a qualified nurse?                                     | - 1 year                          | 1-2 years                     | 2-3 years             | +3 years |
| 4. In which country did you First qualify as a nurse?                             | Africa                            | Asia                          | Australia/NZ          | Europe   |
|   | India                             | Saudi Arabia                  | USA/Canada            |          |
| 5. In which field was your <b>FIRST</b> qualification?                            | General                           | Mental Health                 | Children              |          |
|   | Midwifery                         | Learning Disability           |                       |          |
| 6. What is the Highest level of Academic award you have <b>completed</b> ? Degree | High School                       | Bachelor Degree               | Bachelor              |          |
|   | Certificate/Diploma               | <b>Non-nursing</b>            | <b>Nursing</b>        |          |
|   | Masters Degree <b>Non-nursing</b> | Masters Degree <b>Nursing</b> | Doctorate             |          |
|   | <b>Professional/PhD</b>           |                               |                       |          |
| 7. What is your nationality?  | African                           | Asian                         | Australian/NZ         |          |
| European  | Indian                            | Saudi Arabian                 | USA/Canadian          |          |
| 8. What is your first language?   | Arabic                            | African Language Group        | Asian Language Group  |          |
|   | English                           | European Language Group       | Indian Language Group |          |
| 9. How many years have you  |                                   |                               |                       |          |



Been in your current post?      - 1 year      1-2 years      2-3 years      +3 years

---

### SECTION 3 – Information about your experience of administering medications

In this section, please *circle* the correct answer

10. How often do you administer medications to patients under the supervision of another nurse?
- |                          |                           |                      |                       |
|--------------------------|---------------------------|----------------------|-----------------------|
| At least once each shift | At least twice each shift | Once or twice a week | Less than once a week |
|--------------------------|---------------------------|----------------------|-----------------------|
11. How often do you administer medications to patients jointly with another nurse?
- |                          |                           |                      |                       |
|--------------------------|---------------------------|----------------------|-----------------------|
| At least once each shift | At least twice each shift | Once or twice a week | Less than once a week |
|--------------------------|---------------------------|----------------------|-----------------------|
12. How often do you administer medications to patients independently and without direct supervision?
- |                          |                           |                      |                       |
|--------------------------|---------------------------|----------------------|-----------------------|
| At least once each shift | At least twice each shift | Once or twice a week | Less than once a week |
|--------------------------|---------------------------|----------------------|-----------------------|

---

### SECTION 4 - Information about your views about medication errors

In this section please circle the correct answer and use the box to write your answer where asked

13. Which one of the following do you consider to be the MOST important when administering medication?
- Right Patient    Right dose    Right route    Right time    Right medication
14. Which one of the following do you consider to be the LEAST important when administering medication?
- Right Patient    Right dose    Right route    Right time    Right medication

15. Based on your experience as a nurse, what do you consider to be the **contributing factors** of medication errors?

Interruptions during medication rounds	Strongly agree	Agree	Disagree	Strongly disagree
Lack of familiarity with medications	Strongly agree	Agree	Disagree	Strongly disagree
Lack of supervision for inexperienced staff	Strongly agree	Agree	Disagree	Strongly disagree
Inadequate initial nurse training	Strongly agree	Agree	Disagree	Strongly disagree
Poor quality control and management	Strongly agree	Agree	Disagree	Strongly disagree
Lack of post-qualifying training	Strongly agree	Agree	Disagree	Strongly disagree
High workload	Strongly agree	Agree	Disagree	Strongly disagree
Lack of administration experience by newly qualified nurses	Strongly agree	Agree	Disagree	Strongly disagree
Lack of medication skills competence by nurses	Strongly agree	Agree	Disagree	Strongly disagree
High patient to nurse ratio on wards/units	Strongly agree	Agree	Disagree	Strongly disagree
High levels of patient need	Strongly agree	Agree	Disagree	Strongly disagree
Lack of training	Strongly agree	Agree	Disagree	Strongly disagree
'5 rights' not followed	Strongly agree	Agree	Disagree	Strongly disagree
Drugs which look alike or have similar sounding names	Strongly agree	Agree	Disagree	Strongly disagree
Unclear verbal instructions between doctors and nurses	Strongly agree	Agree	Disagree	Strongly disagree
Poor handwriting by doctor	Strongly agree	Agree	Disagree	Strongly disagree
Misunderstanding due to language differences between nurses	Strongly agree	Agree	Disagree	Strongly disagree

16. **In the last 12 months** have you witnessed a 'near miss' medication administration error by another nurse?

YES

NO

17. What type of error was it?

Wrong  
patient

Wrong  
dose

Wrong  
route

Wrong  
time

Wrong  
medication

18. Did you intervene to prevent the error?

YES

NO

19. Please explain in your own words the reasons for your decision indicated in question 21.

.....  
.....  
.....

20. **In the last 12 months** have you witnessed an **actual medication administration error** by another nurse?

YES

NO

21. What type of error was it?

Wrong  
patient

Wrong  
dose

Wrong  
route

Wrong  
time

Wrong  
medication

22. Did you challenge the nurse concerned?

YES

NO

23. Please explain in your own words the reasons for your decision indicated in question 25.

.....  
.....  
.....

24. Have you ever reported a medication administration error by another nurse using your hospital reporting system?

YES

NO

25. Please explain in your own words the reasons for your decision indicated in question 27.

.....  
 .....  
 .....

26. Please indicate the extent to which you agree or disagree with the following statements:

<b>Use of bar coding technology on medication labels can reduce medication errors</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Use of dispensing technology can reduce medication errors</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>It is important to report medication errors even whether or not harm to the patient may occur</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Managers should monitor medication errors made by nurses</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Patients and family have a right to be told about medication errors whether or not harm to the patient may occur</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>My hospital medication procedures promotes errors</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>My hospital medication procedures is effective in protecting patient safety</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>My hospital medications procedures cause stress or unnecessary pressure on nurses</b>	Strongly agree	Agree	Disagree	Strongly disagree

27. Please state the extent to which you agree with the following statements:

<b>I have made at least one medication error in the last 12 months which resulted in no harm to the patient</b>	Agree	Disagree
<b>I have made at least one medication error in the last 12 months which resulted in potential harm to a patient and which needed to be resolved medically</b>	Agree	Disagree
<b>I have observed at least one error or potential error by another nurse in the last 12 months</b>	Agree	Disagree
<b>I have reported an error which I made</b>	Agree	Disagree

28. Please state the extent to which you agree or disagree with the following statements:

<b>I have not reported an error because I was afraid of the potential punishment</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>I believe other nurses do not report errors because they fear punishment</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Some nurses do not report errors because of different cultural view about what constitutes an error</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Some nurses do not report errors because of different professional views about what constitutes an error</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Nurses have a professional duty to report medication errors</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Nurses who report their own errors should be supported with additional training</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>Sanctions against nurses should be proportionate to the consequences of the error and whether the nurse has self-reported</b>	Strongly agree	Agree	Disagree	Strongly disagree
<b>In some circumstances it is better to ignore a medication error</b>	Strongly agree	Agree	Disagree	Strongly disagree

---

***The end of the questionnaire. Thank you for your participation.***

***Please now place the document into the envelop provided and drop it into an Internal Mail Drop for return to the researcher. That way you remain anonymous.***

***Thank you again.***

## **Appendix (3): The World Health Organization's (WHO) steps of translation and adaptation of instruments**

### **Process of translation and adaptation of instruments**

The aim of this process aimed to reach to different language versions of the English written instrument so that what results is conceptually equivalent in each of the target countries/cultures. That is, the instrument should be equally natural and acceptable and should perform practically in the same way. The focus is on the cross-cultural and conceptual understanding, rather than on linguistic and literal equivalence. A well-established method to achieve this goal is to use forward-translations and back-translations. This method has been refined in the course of several WHO studies to result in the following guidelines.

### **Implementation of this method includes the following steps:**

- Forward translation
- Expert panel Back-translation
- Pre-testing and cognitive interviewing
- Final version

#### **1. Forward translation**

One translator, preferably a health professional, familiar with terminology of the area covered by the instrument and with interview skills should be given this task. The translator should be knowledgeable of the English-speaking culture but his/her mother tongue should be the primary language of the target culture.

Instructions should be given in the approach to translating, emphasizing conceptual rather than literal translations, as well as the need to use natural and acceptable language for the broadest audience. The following general guidelines should be considered in this process:

- Translators should always aim at the conceptual equivalent of a word or phrase, not a word-for-word translation, i.e. not a literal translation. They should consider the definition of the original term and attempt to translate it in the most relevant way.
- Translators should strive to be simple, clear and concise in formulating a question. Fewer words are better. Long sentences with many clauses should be avoided.
- The target language should aim for the most common audience. Translators should avoid addressing professional audiences such as those in medicine or any other professional group.

They should consider the typical respondent for the instrument being translated and what the respondent will understand when s/he hears the question.

- Translators should avoid the use of any jargon. For example, they should not use:
  - technical terms that cannot be understood clearly; and
  - colloquialism, idioms or vernacular terms that cannot be understood by common people in everyday life.
- Translators should consider issues of gender and age applicability and avoid any terms that might be considered offensive to the target population.

## **2. Expert panel**

A bilingual (in English and the target language for translation) expert panel should be convened by a designated editor-in-chief. The goal in this step is to identify and resolve the inadequate expressions/concepts of the translation, as well as any discrepancies between the forward translation and the existing or comparable previous versions of the questions if any. The expert panel may question some words or expressions and suggest alternatives. Experts should be given any materials that can help them to be consistent with previous translations. Principal investigators and/or project collaborators will be responsible for providing such materials. The number of experts in the panel may vary. In general, the panel should include the original translator, experts in health, as well as experts with experience in instrument development and translation.

The result of this process will produce a complete translated version of the questionnaire.

## **3. Back-translation**

Using the same approach as that outlined in the first step, the instrument will then be translated back to English by an independent translator, whose mother tongue is English and who has no knowledge of the questionnaire. Back-translation will be limited to selected items that will be identified in two ways. The first will be items selected by the WHO based on those terms / concepts that are key to the instrument or those that are suspected to be particularly sensitive to translation problems across cultures. These items will be distributed when the English version of the instrument is distributed. The second will consist of other items that are added on as participating countries identify words or phrases that are problematic. These additional items must be submitted to WHO for review and approval.

As in the initial translation, emphasis in the back-translation should be on conceptual and cultural equivalence and not linguistic equivalence. Discrepancies should be discussed with the editor-in-chief and further work (forward translations, discussion by the bilingual expert panel, etc.) should be iterated as many times as needed until a satisfactory version is reached.

Particularly problematic words or phrases that do not completely capture the concept addressed by the original item should be brought to the attention of WHO.

## Appendix (4): Invitation to participate in research project



### INVITATION TO PARTICIPATE IN RESEARCH PROJECT

#### PROJECT TITLE:

#### **Perceptions of nurses in relation to Medication Administration Errors**

Dear Colleague,

I am writing to invite you to participate in this research project which is part of my studies for a PhD. The project aims to explore how medication errors occur in hospitals in the Hail region.

Enclosed you will find a **Participant Information Sheet** which provides further detail of the study. You will also find a **Questionnaire** which you are invited to complete if you agree to participate. There is also an envelope marked '**Confidential**' for the return of forms.

If you think you might like to participate, please read the Participant Information Sheet before starting the questionnaire.

, *you may offer to be interviewed in a confidential setting*. If you would like to do this, please complete the box at the bottom of this letter and return all documents in the envelop provided. You will be contacted so that you can discuss the option of an interview. return this form with a personal telephone or email contact

Please note that this study is designed to keep your identity confidential so you are not obliged to contact me or discuss anything about the study with anyone else. If you do need more information you can contact my supervisor, Dr Alison Brettle, [a.brettle@salford.ac.uk](mailto:a.brettle@salford.ac.uk).

Thank you for your consideration.

Regards

**Talal Al-Reshidi**

Post-graduate Research Student,

University of Salford, England



## **Appendix (5): Reply Slip (Pilot Interviews)**

### **Research Study**

*Nurses' perceptions of medication administration errors in hospitals in the Ha'il region of Saudi Arabia*

I would be interested in being contacted to take part in an in-depth interview, my contact details are:

***Name:***

***Hospital/Centre:***

***Ward:***

***Telephone:***

***Mobile:***

***Email:***

Place in envelope with completed questionnaire

Thank you

Talal AlReshidi  
Researcher

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(Version 1- 1.2.14)

## **Appendix (6): Poster (Pilot)**

### **Poster Invitation**

#### **INVITATION TO PARTICIPATE IN RESEARCH PROJECT**

##### **PROJECT TITLE:**

##### ***Perceptions of Nurses in Relation to Medication Administration Errors***

##### **Aim of study**

Your help is invited for this research project which aims to gather confidential information from nurses about medication administration errors. The study results will be used to develop effective training and medication management procedures. Information gathered could help to understand why errors occur and so help to reduce them. This should improve patient safety.

##### **The researcher**

The researcher is a Saudi national who is undertaking PhD studies in the UK. The focus of the study is Saudi Arabia which is why you are being invited to participate.

##### **Confidentiality**

It is not the purpose of this study to report nurses to management. All information will be treated as confidential and only the researcher will have access to this data. You will not need to give your name to the interview or anyone else. You will be able to have a chaperone of your choice present at all times. They will need to agree to keep the content of the interview confidential to protect themselves and you. A recording will be made of the interview but this will be destroyed as soon as the information has been transcribed into text. You will be given further information about this if you decide to participate. When the report is published no information will be tracked to any individual.

##### **How you can participate**

You are asked to attend an interview which should last between 40-60 minutes. Times can be flexible to fit around work. The interview will take place on hospital premises but in a discrete area away from general ward activities.

##### **Voluntary**

This is a voluntary request and no-one is required to be involved. But it would be very helpful to have the views of nurses about this important topic.

##### **How you can express your interest**

Send an email from a **PERSONAL** account to [t.m.alreshidi@edu.salford.ac.uk](mailto:t.m.alreshidi@edu.salford.ac.uk). Please provide **INITIALS only** – you do not need to give your full name. The researcher **will contact you privately** using your initials and arrange a convenient time for the interview.

## **Appendix (7): Interview Guide (Pilot Interviews)**

### **Information**

Ensure that participant has read and understood Participant Information Sheet

Provide opportunity/invite questions/clarification

### **Consent**

Ensure that all questions are answered and boxes ticked with date.

### **Direct Questions**

The format of the questionnaire is followed in the same sequence. The qualitative questions should be asked in the order and sequence in which they occur.

### **Free/open/non-choice Questions**

10b, 11b, 15b, 19, 21

Should use the 'opening' question used in the questionnaire format to begin:

*Please explain the reasons for your answer* (to the previous question)

Then

*Can you give me some more detail about...*

Or

*You mentioned ...x.. can you expand on that please?*

Or

*Can you explain what you meant by ...x...?*

Provide opportunity at end of questions to 'add' anything to any of the answers provided.

## **APPENDIX (8): Nurses' Semi-structured Interview schedule**

### **Introduction**

**I would like to appreciate taking time to attend this interview and want to assure you that everything you say in the interview will be definitely confidential**

**Can I ask you just to sign the consent form please as it is a part of the interview?**

### **Warming questions**

1. What nursing area are you working in at the moment?
2. Is this your favourite area?
3. How long have you been working in this area?

## **Nurses' perceptions on medication errors**

**Aim of the interview:** The aim of this study was to investigate nurses' perceptions of medication errors in hospitals in the Ha'il region of Saudi Arabia

### **Nurses' Experience**

Can you describe your experience of administering medications within your area of work?

### **Independence in medication administration**

To what extent you think you can administer medications independently? Do you need any sort of help and how?

**Can I hear your impressions on five of hypothetical scenarios to see how nurses deal with such situations in drug administration? How are you going to act if you were in that situation?**

#### **First Scenario:**

*Suhail is a nurse working in the medical ward and has 20 patients in the ward. Suhail was to give medication to one of the patients and was confused between two hand written medications appeared similar to him. He gave the medication to the patient who told him that he has a different medication being given to him usually. Suhail has checked the medications on patients' files and recognised that he swapped two medications between two patients.*

#### **Second Scenario:**

*A nurse received and accepted a telephone order for Penicillin 1 g IM for one of patients in the ICU unit but transcribed the order on the patient's order sheet as Penicillin 1 g IV. The nurse was busy and told one of the junior nurses to give the medication for that patient.*

*The patient has experienced anaphylactic shock and the nurses had to shout the emergency team who helped the patient to save his life. Fortunately, the patient started to be stable and recovering his health. The patient's brother was asking about what happened to the patient and if he can have a report of that incident.*

#### **Third Scenario:**

*A nurse was walking into a patient's room in one of hospitals in Saudi Arabia and administering medications for 10 patients in the ward. One of these patients had switched hospital beds with his roommate to be closer to the window. The nurse has checked patient's identity during initial drug administration but failed to check it again during subsequent administrations. The nurse, during verifying patient's identity, was interrupted by a visitor asking a question, and the nurse simply forgot to complete the verification process in the second check phase ending with a medication given for wrong patient. The nurse was confused and not sure if she had to report or tells the manager about the error. She was also concerned if any change will happen to the patient and any response from patient's family.*

#### **Fourth Scenario:**

*A nurse who works in a surgical unit has prepared and delivered medications for patients in the unit. John was a patient who was transferred to the X-ray for diagnostic image and returned three hours after the medications have been given. The nurse had to prepare that medication and give it to John. John told the nurse that this drug is 4 hourly drugs and he has the next dose should be given after one hour. The nurse told the patient that he has to take the medication now and we can postpone the next dose to be given later.*

#### **Fifth Scenario:**

*Ahmad is a pharmacist preparing a chemotherapy for patients in the cancer unit. Two patients were taking the same medications and Ahmad has packed these medications in one bag. The nurse Sami who works in the ward has given the medication for the first patient and went to answer the phone. By that time, the other nurse Tameem came to help Sami and has given the second medication to the same patient. Sami finished with phone and returned back to give the second medication to the second patients and could find it. When he asked Tameem about the medication they (Sami and Tameem) recognised that two doses were given for the same patient.*

- In your opinion how does each of the following impact upon medication administration errors in nursing practice?

Age barrier (your or patient's age)  
Gender issues patient being male and nurse female  
Years since qualification  
Country of qualification  
Field of first qualification

Education degree

**In more details can you just tell me how this factors influence your performance regarding medication errors?**

**Individual Level**

**Environmental level**

**Organisational level**

## **Factors behind hiding medication errors**

In your opinion, what factors may encourage or stop you reporting medication error?

In your opinion, to what extent your education and training may influence your ability to administer medications safely.

In your opinion, what are the strategies that can reduce medication error?

**Do you have any further strategies that can minimize the errors number in your hospital?**

**Do you have any further comments about medication administration and medication safety?**

**End of Interview:**

***Thank you for taking time to come to an interview what we have discussed  
has been very interesting and pertinent to my research.***

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(Version 1- 24.05.14)

## Appendix (9): Agreement from hospitals Administration for study

Hotmail Print Message

صفحة 1 من 1

**RE: Ethical Approval**

From: **Asst-plan Asst-plan** [asst-plan@hailhealth.gov.sa]  
Sent: Saturday, September 29, 2012 12:58:44M  
To: talal7900@hotmail.com

**RE: Ethical Approval**

**Date:** 12/09/2012

**Dear, Mr. Talal Alreshidi**

Regarding your application for Ethical approval on your study in Hail Province hospitals. I am delighted to inform you that your study has been approved to collect your data from the hospitals staff and access any necessary data which may support your study.

Your sincerely

**Assistant General Director for Planning and Training**  
**Dhabi Khalaf Alskaibi**

---

Meg sent via Atnail - <http://atnail.com/>

...8e400237de45652,m&:sSafe=true&FolderID=7d7f8d19-6177-448c-b70d-4be4d3e95ef3 11/11/12

## **Appendix (10): Participant Information Sheet**



Date:

### **PARTICIPANT INFORMATION SHEET**

This Participant Information Sheet is intended to provide you with information about this study so that you can make an informed decision about participating.

### **PROJECT TITLE:**

#### **Perceptions of Nurses in Relation to Medication Administration Errors**

#### **The aims of the study**

The study aims to gather confidential information from nurses in the Ha'il region about medication administration errors by nurses in their everyday activity. It is not the purpose of this study to report nurses to management or to compare medication errors between hospitals. The study results will be used to develop effective training and medication management procedures. Information gathered could help to understand why errors occur and help to reduce them. This in turn should improve patient safety.

#### **Anonymity and confidentiality**

All information provided will be completely confidential. No personal identifying data is requested. Because this research is anonymous you will not be asked to complete a consent form in the usual way. But, if you return the attached questionnaire you are asked to tick two boxes on the form to say that you have read this Participant Information Sheet and that you have made an informed decision to provide the information requested.

This is a sensitive area for research and you should be assured that in answering the questions you will not be compromised. Steps have been taken to ensure that the information you provide cannot be traced back to you individually or the hospital in which you work. No individual responses will be reported or attributed to you personally. Your responses will be combined with others' to provide recommendations for future training and medication practices.

#### **Why have you been chosen?**



No-one has been chosen individually. All Registered Nurses working in the hospital have received this information. No personal records about your performance or employment have been used in this process. It is not possible to identify you personally in this process.

### **Participation is voluntary**

You do not have to participate. There are no negative consequences if you do not return the questionnaire. Because it is anonymous the researcher will not know who has and who hasn't returned the forms. If you decide not to participate you can simply return all the documentation in the envelope marked *Confidential*.

### **How information you provide will be handled and stored**

Information which you provide will be treated as confidential. It will never be possible to identify you by name or location. Information will be transferred into a data management system which will be kept securely. Access will only be possible for the researcher and the supervisor to access.

No information will be passed to any management or supervisors in your hospital. When the final report is published no individuals will be named or identified because the researcher will not have that information. If you look at the questionnaire, this will become clear.

For ethical reasons the information which comes from this study has to be kept at the university in England for a 5 years. It will be kept in locked drawers in a locked and supervised office. Only the researcher and supervisor will have access to this. This data will eventually be destroyed.

### **What you are asked to do**

Attached you will find a questionnaire which you are asked to complete as fully as you can. You are asked to answer most questions by ticking or circling a chosen answer. But there are some questions where you have a choice of answering in English or Arabic, whichever, you find easier to express yourself. These questions are identified. When you have completed the form simply return in the envelope marked *Confidential*. If you like, you can provide additional information via a confidential interview. If you choose this method please complete the box at the end of the questionnaire and return in the envelope marked confidential.

### **How to give your consent without giving your name**

At the beginning of the Questionnaire you will see two questions which ask you whether you have read this information sheet and whether you consent to participate willingly. If you wish to participate, you are asked to 'tick' both boxes. To maintain your confidentiality, that will be sufficient. However, if you return a questionnaire WITHOUT BOTH boxes ticked, your consent

cannot be presumed, and your questionnaire will be destroyed and not used. This is to ensure that the information used in the study and final report can be shown to be valid.

### **Dissemination of study results**

When the study has been completed, it is expected that presentations will be made to different groups in the hospital, including nurses. Results will also be published in academic journals.

### **Supervision of this study**

This study is supervised by Dr A Brettle of Salford University and has been approved by the Ethics Committee of the School of Nursing, Midwifery and Social Work, University of Salford

## Appendix (11): Ethical Approval – University of Salford

University of  
**Salford**  
MANCHESTER

Research, Innovation and Academic  
Engagement Ethical Approval Panel

College of Health & Social Care  
AD 101 Allerton Building  
University of Salford  
M6 6PU

T +44(0)161 295 7016  
r.shuttleworth@salford.ac.uk

[www.salford.ac.uk/](http://www.salford.ac.uk/)

21<sup>st</sup> December 2012

Dear Talal,

**RE: ETHICS APPLICATION HSCR12/76** – Perceptions of medication administration errors by nurses  
in Saudi Arabian hospitals

Following your responses to the Panel's queries, based on the information you provided, I am  
pleased to inform you that application HSCR12/76 has now been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as  
possible.

Yours sincerely,

*Rachel Shuttleworth*

Rachel Shuttleworth  
College Support Officer (R&I)

## Appendix (12): 2<sup>nd</sup> Ethical Approval – University of Salford



Research, Innovation and Academic  
Engagement Ethical Approval Panel

College of Health & Social Care  
AD 101 Allerton Building  
University of Salford  
M6 6PU

T +44(0)161 295 7016  
r.shuttleworth@salford.ac.uk  
www.salford.ac.uk/

15 August 2014

Dear Talal,

**RE: REQUEST TO AMEND ETHICS APPLICATION HSCR12/76 – Perceptions of medication administration errors by nurses in Saudi Arabian hospitals**

Following your request submitted to the Panel on 17<sup>th</sup> July 2014 to amend this previously approved ethics application, based on the information you provided I am pleased to inform you that this has now been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible.

Yours sincerely,

*Rachel Shuttleworth*

Rachel Shuttleworth  
College Support Officer (R&I)

## Appendix (13): Interview Consent

### Research Participant Consent Form

**Title of Project:** Perceptions of medication administration errors by nurses

**Ethics Ref No:** HSCR12/76

**Name of Researcher:** TalalAlreshidi

*(Delete as appropriate)*

- I confirm that I have read and understood the information sheet for the above study (version x- date) and what my contribution will be.
- I have been given the opportunity to ask questions (face to face,via telephone and e-mail)
- I agree to take part in the interview
- I agree to the interview being tape recorded
- I agree to digital images being taken during the research exercises
- I understand that my participation is voluntary and that I can withdraw from the research at any time **without giving any reason**
- I understand how the researcher will use my responses, who will see them and how the data will be stored.
- **I agree to take part in the above study**

Yes	No	
Yes	No	
Yes	No	NA
Yes	No	NA
Yes	No	NA
Yes	No	
Yes	No	
Yes	No	

Name of participant

.....

Signature

.....

Date

.....

Name of researcher taking consent

.....

Researcher's e-mail address .....

***I certify that the above information is, to the best of my knowledge, accurate and correct. I understand the need to ensure I undertake my research in a manner that reflects good principles of ethical research practice.***

Signed by Student \_\_\_\_\_

Print Name \_\_\_\_\_

Date \_\_\_\_\_

***In signing this form I confirm that I have read this form and associated documentation.***

***I have discussed and agreed the contents with the student on \_\_\_\_\_***

***(please insert date of meeting with student).***

Signed by Supervisor \_\_\_\_\_

Print Name \_\_\_\_\_

Date \_\_\_\_\_

**APPENDIX (14): Reply Slip (In-depth interview)**

**Research Study**

*Nurses' perceptions of medication administration errors in hospitals in the Ha'il region of Saudi Arabia*

I would be interested in being contacted to take part in an in-depth confidential interview, my contact details are:

***First Name:***

***Nationality:***

***Gender:***

***Hospital:***

***Ward:***

***Telephone:***

***Mobile:***

***Email:***

I understand that you will contact me to arrange a convenient time and location with presence of chaperone if needed.

Thank you

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## **APPENDIX (15): Invitation to participate in research project (in-depth interviews)**



School of Nursing, Midwifery and Social Work  
College of Health & Social Care  
Frederick Road Campus  
Salford  
M6 9PU

### **INVITATION TO PARTICIPATE IN RESEARCH PROJECT**

#### **PROJECT TITLE:**

#### **Perceptions of nurses in relation to Medication Administration Errors**

Dear Colleague,

I am writing to invite you to participate in this research project which is part of my studies for a PhD. The project aims to explore how medication errors occur in hospitals in the Hail region.

Enclosed you will find a **Participant Information Sheet** which provides further detail of the study. You will also find a **Reply Slip** which you are invited to complete if you agree to participate. There is also an envelope marked '**Confidential**' for the return of reply slips.

If you think you might like to participate in the interview which will take place in a confidential setting, please complete the reply slip and return in the envelope provided. You will be contacted so that you can discuss the option of an interview. Please return this form with a personal telephone or email contact.

Please note that this study is designed to keep your identity confidential so you are not obliged to contact me or discuss anything about the study with anyone else. If you do need more information you can contact my supervisor, Dr Alison Brett, [a.brett@salford.ac.uk](mailto:a.brett@salford.ac.uk).

Thank you for your consideration.

Regards

**Talal Al-Reshidi**

Post-graduate Research Student,  
University of Salford, England



## APPENDIX (16): Participant Information Sheet (In-depth interviews)

Date:

### **PARTICIPANT INFORMATION SHEET**

This Participant Information Sheet is intended to provide you with information about this study so that you can make an informed decision about participating.

### **PROJECT TITLE:**

### **Perceptions of Nurses in Relation to Medication Administration Errors**

#### **The aims of the study**

The study aims to gather confidential information from nurses in the Ha'il region about their views of medication administration errors by nurses in their everyday activity. The first phase of the study (questionnaire) is complete. This is for the second phase of the study (interviews). It is not the purpose of this study to report nurses to management or to compare medication errors between hospitals. The study results will be used to develop effective training and medication management procedures. Information gathered could help to understand why errors occur and help to reduce them. This in turn should improve patient safety.

#### **Anonymity and confidentiality**

All information provided will be completely confidential. You will be asked to complete a consent form, but this will not be stored with or linked to the interview data, so that you cannot be identified. This is a sensitive area for research and you should be assured that in answering the questions you will not be compromised. Steps have been taken to ensure that the information you provide cannot be traced back to you individually or the hospital in which you work. No individual responses will be reported or attributed to you personally. Your responses will be combined with others' to provide recommendations for future training and medication practices.

#### **Why have you been chosen?**

No-one has been chosen individually. All Registered Nurses working in the hospital have received this information. No personal records about your performance or employment have been used in this process. It is not possible to identify you personally in this process

#### **Participation is voluntary**

You do not have to participate. There are no negative consequences if you do not participate in the interview. If you decide not to participate you can simply ignore this information.

#### **How information you provide will be handled and stored**

All the information which you provide will be treated as confidential. It will never be possible to identify you by name or location. Information will be transferred into a data management system which will be kept securely. Access will only be possible for the researcher and the supervisor to access.

No information will be passed to any management or supervisors in your hospital. When the final report is published no individuals will be named or identified because the researcher will not have that information. If you look at the questionnaire, this will become clear.

For ethical reasons the information which comes from this study has to be kept at the university in England for a 5 years. It will be kept in locked drawers in a locked and supervised office. Only the researcher and supervisor will have access to this. This data will eventually be destroyed.

#### **What you are asked to do**

Attached you will find a reply slip, which requests your contact details, first name, gender and nationality. This information will be used to purposively select participants if too many people (more than 20) volunteer to take part in the study. If you wish to wish to participate please return the reply slip in the envelope marked **confidential**. If you are selected I will contact you to arrange a convenient time and place for the interview. Once the interviews have taken place, the reply slips will be destroyed.

#### **Dissemination of study results**

When the study has been completed, it is expected that presentations will be made to different groups in the hospital, including nurses. Results will also be published in academic journals.

#### **Supervision of this study**

This study is supervised by Dr A Brettle of Salford University and has been approved by the Ethics Committee of the School of Nursing, Midwifery and Social Work, University of Salford